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Anatomical Lectures

By

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Delivered Winter 1774/5

Wrote By Robt. Lyon Student

1778

Volume V.

Lecture 82d

We have now examined fully the Organs of Generation in both Sexes, We shall consider at this meeting the effects, and the Gent treatment of the Venereal Disease.

Notwithstanding the frequency of this Disease, & the number of Books which have been wrote upon it; I find scarce a number of Observations on it, which are of real importance in the cure. Where the cause has been either overlooked by Authors, or improperly assigned, and hence they are misled in the Method of Cure. You all know that this Disease is not conveyed in the Air, altho' the contrary has been alledged; Nay even where the Poison is not in contact with

with the sound parts of the skin we not only do not find that it enters the harder parts by the mouths of the absorbents, but it seems incapable of exciting such a degree of inflammation as to occasion a cession of the part; his a proof that the harder parts scarcely suffer from the contact, we see that surgeons deeply treat venereal sores with impunity. But if the poison be applied to the thinner, tender parts of the skin, such as the glans penis, or organs of generation in the female, surface of the lips &c it can be tried into the body, tho' there is no wound previously in the part; or I suspect that it enters through these by the natural mouths of the absorbent vessels. I not only find this fact affirmed by authors of considerable accuracy as Fallopius;

But

But I have seen half a dozen Bubos, where I could not observe a chancre, nor learning. Now if we are to imagine, that there has been before that, some little fissure in the skin, by which ye Poison entered; I would conceive that ye Poison lodged there, would have converted it into a sore; so it appears that it may be effected without erosion, tho I am not positive of the fact.

Next, let us suppose the poison to lodge upon the part, it produces an Ulceration, which we call a chancre, but previous to this ye part inflames, & swells, the appearance varying very much, sometimes spreading over a considerable part of the surface without being much elevated, but in other places it produces a sound Pustule, the very point of such pustules, and this perfectly spherical. Now in

in this case, of Your question most Physicians concerning the cause of the appearance; They would tell us They conceived a Particle or Particles of the Venereal Virus to be lodged there, That the affection was Local, forasmuch as I imagine that the Poison first enters, then is thrown out again in Chancres: And yet I do not find that any Writer proposes to Cut accordingly, and make a cure by Local remedies. Now as I was always fully convinced, That the Disease was confined to the very spot of the Pimple or blister, I have made the attempt of curing & have succeeded in a short space, by touching a Chancre with Silver Caustic. At first I suspected that perhaps a single touch would be sufficient, That it might penetrate and destroy

as

as the Mineral Poison, but the whole fresh Pustule must be consumed by repeated applications, for as soon as any surface separates a second is formed, till the whole is destroyed. And in this way I have seen Cancers cured in the space of Four Days, which otherwise must have taken as many Weeks. At the same time I by no means advise this in all cases, as where the Ulceration is extensive I would here thinke the common method preferable because of the Pain which the other method excites. And where it is practicable I would not, perhaps entirely to Rest out, but would give at the same time some quantity of Mercury, because whilst we destroy the Poison of the part, a small portion may have

have entered to taint the Mass of blood.

Next, you have offered that Bubos accompany or rather follow Chancre. I have already hinted the improbability of a Bubo occasioned without a Chancre: Because of the Bubo I might take for granted as already known, the Glands of the groin swell, by the translocation of the Venus from a Chancre into them; and you remember the proof I gave you, that it is the superficial glands of the Inguinal cluster alone, which are generally swelled; and in Dissections I found that the Lymphatics from the root of the Penis, run to the superior end of the Inguinal glands, and we can sometimes trace a hard chord from the Penis into, or near the groin. Now, after knowing fully the cause of Bubo, we would be

called to the cure, First, to the attempt of stopping the intercourse between the Body & it, by incisions, or by promoting suppuration; and there are no doubt of the wire medicy to spend here, that the bringing a Bubo to suppuration is the safest method of curing it. But they are so tedious, that I would join with Astruc &c who advise us to attempt to disperse, rather than to suppurate them. The cure is completed with abundant safety, as soon Mercury is given early, we prevent the bad effects of the Virus on the Mass of Blood. Now, for this purpose, beyond Doubt I know that Mercury is the chief remedy, though it Quicken the Pulse, & lessens the Inflammation & serves to prevent the [illegible] cation, or f[illegible]

1101. to Discuss the Bubo, nor will any Ext.l
application have such effect as the giving
Mercury Internally. We may expect Ext.l
applications, but I doubt of the Mercurial Ointment
be so proper as a Solution of Sacharum Saturni.
If we were hereto speculate we imagine
that the making Mercury pass Directly thro' the
Lymphatic vessels into the Spot Diseased, wd
have singular effect, but I am not altogether
sure of this, whether we would not sooner over=
=come the Disease by rubbing the Mercury on
the Groin affected or on the other.
Now, when Mercury poisons, afterwards
it passes thro' the Lymphatic vessels and
Glands in the Loins, and gets into ye Venous
Duct, & so into the Mass of Blood. After which for

for several months, say two at least, the Patient feels no very bad effect, or is not sensible of any considerable Disorder; But after that it breaks out into blebs. Now, We find a Difficulty here to account for this, but this Difficulty is common to this with other Diseases. So if the Small Pox be inoculated you know that the Pus do not sicken till about a week, Why not sooner? For I have no doubt that the Pus cut out the place where the inoculation was done two or three hours after you have made the incision, you could not prevent the Disease taking place. At the same time I do not deny that the particles which form sooner near the incision have their matter afterwards taken in. Some have conceived that the infection is com-

communicated in that way, only that the Incision makes an Inflm which produces Variolous matter, & that that is taken in. But that from another Person may enter as well as this. So upon the whole the Poison is Multiplied in ye blood, in a manner we do not know, after wh we find it appears more readily first in the Throat, and of the Throat more readily in the Amygdala, then the Vulvum comes to be affected, in some Persons the Tongue & Gums; I have seen the Gums of the forehead so affected, that the Patient who had Medical Skill believed it a Scurvy rather than the Lues.

After the Throat, the Skin becomes affected, then the Bones, and those different from the way which Boerhaave Represents. He

We supposed the Marrow to be first affected, because the Antidote, Mercury, consumes the fat, whereas the Periosteum is the first tainted, then the surface of the Bone under it, and lastly the Marrow. May so far as it seems affected the Marrow first, that the hardest parts of the Bones at their middle most frequently, while other Diseases more readily appear in the extremities of the Bones.

In whatever way the Poison may have got into the Mass, or afterwards affected particular parts, I apprehend the cure may be completed without any Chemical preparation of Mercury and that those in Practice are altogether useless. At least I have seen cases of the worst kind where Corrosive Sublimate had been taken for

1105. for a length of time yield to the Mercurial Pill, which you now have in the last Edition of our Pharmacopœia. Let us only continue the course slowly without intermission, and for a sufficient length of time; scarcely any case will require more than three months; and for the most part it will yield in half that time, without pushing the Mercury further than to occasion a slight swelling of the Gums, and a soreness.

I have seen in this manner not only Caries of the Bones cured, openings being first made to let out the matter; but at the same time several of the Principle joints of the body were so much swelled, that at first when the knee was uncovered, the Patient seemed to be labouring under white swelling.

Next

Now, as in this manner We can cure the affection after it fixes upon a particular part, so by a smaller quantity We prevent from fixing at all. Therefore Mercury does not act merely from being concentrated, but acts against the Poison while it floatt, against the gen.l Mass. I do not mean to deny that somewhat is necessary to be evacuated, that is a point we are not able to determine, whether the Mercury is to be reckoned as a specific destroying ye Venus, as an Acid destroys an Alkali; or that it is particularly fitted for opening the Outlets of the body and evacuating it. After Having ye course of the Poison which is most evident where Inflamm.n & Ulcers are in our sight. I have found that it may enter the body without ye

1107. The intervention of Bubo, tho' this is often
observed, yet sometimes Chancres produce Pox, without
this intervening; so we are not to trust to the
cure of Chancres by special means, tho' they
should heal up without producing a Bubo.
In like manner, tho' a Bubo suppurates, we are
by no means to conclude that the whole virus
is evacuated, for while one portion of it has
entered the gland, another portion may have
entered by the higher Lymphatics.
Now, let us trace the Poison where Urethra
is affected and a Gonorrhoea or running is
produced. First, I wd observe an error wh
many entertain, that this disease and the
Pox are very different diseases, and produced
by a matter of a different kind. But I wd

would allege that the same disease affects differently, different organs; and as a proof of it, I know certainly, that a Person having Chancres, can communicate Gonorrhoea, or perhaps both. In the first place, I am going soon to affirm as a fact, that the Gonorrhoea often produces, a Bubo; Nay, that without producing Bubo it occasions the consum'd Chancres. If you allege that Gon.a does not produce Chancres on the Glans of the Person labouring under it — I see a difficulty of explaining this, But I observe the same thing in the case of Chancre itself; Why does not One Chancre produce Another? Sometimes One Produces more; so that Astruc is mistaken here; but surely after a few days you can determine how many Chancres a Person will have

1169. have, and yet the Venereal Poison passing from the Glans touches the Rest of it. So the only Argument of Wright here is of no Moment.

Next let us see if We can account for ye poison getting into the Urethra, which is a circumstance that cannot be altogether explained. Some of ye ancient with regard to it must be rejected, as that it passes by Lymphatick Vessels, or Absorbent Veins into ye Urethra, as in that case the Urines would be carried immediately & directly to ye Inguinal Glands; but we cannot conceive Absorbent vessels passing thro the cells of the Penis, and stopping there. Neither would I admit ye passage that the Glans, like a Sponge, receives the Urines to pass thro its pores; but consider only ye intervention of the Cellular as of the Penis in what manner

y^e

the blood is extravasated. so we must admit of the most simple, & common opinion, that the poison enters the extremity of the urethra. How it enters, I cannot well define, probably in the way that water or oil enters between two glass planes, that is sucked in by attraction. or when the penis is erected, the mucous matter is forced out from its cathumidy, a drop of which shuts there, and when the cells are again emptied it sinks down within the urethra which is now flaccid & draws back again. another circumstance leads to the same idea, of fluid present within the nose, the mothers of which could not have entered there but must have lodged in the mucous of the nose, perhaps when the person was asleep, & on waking they might have been drawn up within the nose. It is probable that the venereal virus enters in the same manner.

after

1111. After it has ended I have known the common appearance of the change of Colour of the Mucus, and the pain which it occasions, which is not diffused over the whole Penis. There is no just comparison between the Gonorrhoea & Gallarch, for in ye latter the whole Membrane is affected equally, in the Gonorrhoea it is very much otherwise, for Barber's spots chiefly suffer, and most readily & commonly a spot in the Glans, about a fingers breadth from its extremity, just over the Frenum at ye lower part, there the Patient chiefly feels pain, and which is increased on Touching or on the introduction of the ~~finger~~ Probe. This also appears from observing the effect of an irritating injection, and from observing the feelings of the Patient when he makes water, when he allays it by the pressure of ye fingers to come gradually forwards, & [illegible] feel

but little pain till it comes to that part.
Then when the disease has made greater progress, particular spots are chiefly affected, & the disease consequently occasions stricture, or there are marks of Lesion in spots only, just as any case of Chancres, which very often are made up of glands, and which scarcely affect the whole surface of it in an equable manner. Next there is no proof that the Mucous glands of the Urethra suffer less from Gonorrhoea by their presence than we would have done supposing them wanting. So instead of calling these the seat of the disease to which the matter has any affinity, we ought to consider them as pouring out their Mucus to wash off the virus, by which means infection is lessened, as in the case of the Measles where there

1113. There is no determination of the Disease to Mucous organs, but the Matter endeavours to get out of the body at those places where acrid liquors are generally discharged; so there is a push towards the Skin on the surface, and that which is sealed; and the Mucous glands sealed deeper in the passages of the bis, are only affected in a secondary way, because the Disease chiefly lodges in the Exhalent Vessels connected with them. In time the Disease extends further works its way deeper in the Urethra by slow degrees, upon the same principle I suppose on which it enters, & however violent the Disease may have been it is seldom followed while recent by a swelled testicle; it must have wrought its way along the Urethra before that can happen, and still it affects

one

One part more than another, as you will find to be the case in Mortgagee's Depositions.
Next, let us endeavour to determine the particular effect it has on those spots which chiefly suffer.
Are we to say with Many Authors that there are Ulcers produced? Or with some late Authors are we to deny Ulcers altogether? I apprehend the middle course is the best. i.e. That in common slight cases, which have been properly treated, the Membrane is excoriated, and an inflamed state induced, and the Mucus altered in colour in consequence of this, without a real loss of it, and the Globules which we see in it are not particular, but are observable in cases of the common Catarrh. But if it has continued for some time, and been improperly treated

1115. The Disease occurring in an unstable habit, there is no Reason to Deny Ulcerations; Every circumstance speaks that there is an Ulcer in the passage, where the pain is considerable. Next, I have seen frequently a good Deal of blood Discharged in Gonorrhoea. Hence Morgan's Work, tho' he Denies that there is Ulceration in Gonorrhoea; yet examine his cases, and you'll find an inconsistency; for he describes contractions in particular cases, and Cicatrices, with the obliteration of many large Mucous Ducts. Now, he says that these Cicatrices are marks of the former Ulcers, and the places where the urethra matter Distilled from. Now I do to this of Case before us, where there are marks of erosion in the Urethra in the most Distant part from

the

Ulcers — Again, Do we not find Testicles produced in consequence of Gonorrhoea, not only of the Membrane of the Urethra, but of all the Membranes of the Penis May I venture to allege that the Ulcers are more frequent than they appear, from Surgeons Dressers, because Ulcers may exist, and in a short time no Traces of them may remain. So the Marks of Cancers, entirely removed Ulcers in the Throat Disappear, & also in the Papillae of the tongue: And they surely will more readily be obliterated in the Urethra, which is moistened with Slime, and not at all exposed to the Air, to harden the Cicatrix. And I would add that Gonorrhoea does often produce Bubo. This has been denied. But I appeal to Experience, where I have examined every circumstance wth the most attention. 88.

not insist that in every body it is necessary that there should be an Ulcer, But in the Urethra which is defended with slime a Bubo will not easily happen without Ulceration. The only remaining circumstance which I think necessary to enter upon is the Swelling of the Testicle; Astruc and others very conceive that there is a Translation of Morbific matter, they find that this Swelling takes place when the Gonorrhoea is suddenly stopd, so they conceive that the Matter is now translated from the Urethra to the Testicle, and the Swelling is commonly call'd the Gonorrhoea Tentie Dans la Bourse, or Gonorrhoea falling in upon the Testicle or Scrotum. Notwithstand of that, I venture to allege a very different explan^n in

in My Thesis, That there is no translation.
Some talk of the matter going backwards into
the Vas Efferens. Now, can you suppose that ye
Poison can find its way thro' so many turns?
Others, in a vague way talk of Absorbents, or Lymphatics,
But these run all to the Groin, so when ye matter
is absorbed it takes a very different course; & when
the Blood is tainted by the Poison of Chancres, of
Bubaes &c. and there are Ulcers in the Throat,
the Testes do not suffer in any particular manner,
they may swell from a confirmed Lues but we
have seen, even an example of it. Again,
Observe the effect of any commoning taken in the
Urethra; I have known six instances daily of
the Testicle in Gallantous Cases; Dr Hunter
in his act of the Natural operation, Observes

119. That the Testicle sometimes swells. Now if you can account for the swelling in that Case, why not in the Venereal Disease. That of Disease in the Natural progress of Gony Decper in the Urethra, comes to inflame its Membrane, near the Mouths of the Seminal Ducts, and to stop the ends of the Vas Deferens, & that in consequ^t of the inflamation a swelling falls on ye testicle. Just as a flow of Tears or Saliva follows any inflamation in the Eye or Mouth. And as a plain Proof of this, I have observed that the Swelling begins at the Vas Deferens, & goes backwards thro' the Epididymis into the Testes; whereas if it proceeded from the Poison mixed with the Mass of blood, first the gland making ye secretion, then the Duct conveying the Poison would be

be affected. In like manner when ye Swelling subsides, & first begins at the Vas Deferens, then in the Epidydimus, and last of all in the Testicle; so the Running in the Gonorrhoea and Swelling in the Testicle proceed from the same cause; From an irritation & Inflammation in ye Urethra, and therefore to be treated in the same manner: Making an allowance for the greater Delicacy in the structure of the Testicle, and Mercury is not more necessary in the one than in the other, But proper in both, because neither can subsist without Danger of an Abscess & a Confirmed Pox. So as soon as We observe the first appearance of this Affection, We ought to Draw blood freely according to the strength of the Patient, from the arm; If the Swelling continues painfull and

1121. The strength of the Patient will bear it this May be repeated; If not we would draw blood with Leeches from the part; Or We may be content with this alone where the Inflamn is not Gr. ble Then We endeavour to relax the part & disuse the swelling, forming a Poultice with a weak Solution of Sach. Saturn. and covering it with an oil'd Cloth, and let this be applied to the Pubis & Perinæum or Urethra, which is the Chief seat of the Disease. The Warm Bath has likewise a good effect, only it alters the Posture of the Patient, as He is obliged to sit up, whilst a Horizontal posture is very essential in a cure. Now, I alledge that as the Disease depends upon that spasto part of the Urethra being affected, & not merely on a stoppage of Gonorrhoea, which when

which dispel at the beginning does not occasion the swelling; so if you push the matter by an injection backwards into the Urethra, you may very readily occasion a swelling of the Testicle, and in many cases I have seen it occasioned in this way. So if I care to try by the use of injections, which in the way they are commonly used, generally do more harm than good, but it is possible that we may find a Medium which shall act immediately upon the part, but let us prevent the poison from going deeper by making a strong compression on the Urethra beyond the place primarily affected

Lect. 83

As we have now taken the Vessels and Nerves of all the Viscera, and seen the appearance & Numeration of their Ducts, we shall attempt to

1123. to determine the structure which intervenes between the Artery & the Duct.

So Early as the last Century two opinions wt. regard to the structure were proposed, one by Malpighi, and ye other by Ruysch; and with regard to these Anatomists and Physiologists have been since divided. The difficulty here lyes in connecting the secerning branches of the Arteries, with the Duct of a gland making ye secretion. Malpighi was the first who attempted to treat of the structure of Glands, alledged that between ye Artery and Excretory Duct there is interposed a Follicle or Bag. His arguments were drawn merely from very general Observations; such as his finding in the first Passages, in the Mouth, or Intestines that there were little bags which contained Fluid, or that there were large bags in our Amygdale; therefore he supposed that the same kind of structure takes place in

in the compound gland of the liver, or secretory organs — He says that these are divided into lobules, and these still further subdivided, which he compared to little bags resembling the cecal bags, and in some animals he found the division of the lobes into lobules extended further than in others. At least examining such animals in diseases, he remarked larger bags in the liver or kidney, while all the bags were filled with the natural liquors, but without giving any distinct proof, merely judging from the colour, that it was thickened in the liver, and yellowish in the kidney. There is no evidently given reason in that conclusion, tho' he assigned reason for the great bags, for the same that it may be squeezed out on certain occasions as in the urinary where they are emptied during the passage of the urine, by the distension of the canal.

1125. It does not follow that the Muscular parts of the Liver have the same structure, and are to be treated. Notwithstanding Diseases, as the bag and the Kidney inflammations are included in Dropsy. They have no communication with the Veins of the Kidney. And in the Liver if bags are opened when are filled with Gall, they are owing to the corrosion of the Biliary Duct, as is the case in what they call the Rotten sheep, which depends upon a flatt Worm in the Gall Ducts which corrode, and keeping an inflammation with ulcerates the Coats of the Biliary Ducts, then there is a Bag formed and the whole at Bottom of the & it's the liquors cause into Bags, which formerly had no hard or Colour of the same kind before Death.

Thirdly, Again, gradually improved the [illegible] of

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Injecting the Vessels of Animals, which had been practised before in a very unskillful way. He alledged that on making an accurate injection the convolutions of the Kidneys entirely into Vessels, and that all of them were cylindrical. He mentions too that in some few places, as in the Kidney, the injection entered the Veins of it, without any intervening bag, so he explained the Vessels that were cylindrical from the Arteries into the Veins, that they became smaller & much convoluted. But he was far from conceiving his last improvement of it, so he found a dispute between Lower & Boerhaave, which is mentioned just as well as the facts then known admitted of. But notwithstanding the length of time since, not a single Author has made Experiments, nor [illegible] the

1129. Inquiries. We would think at the Artery divides into two kinds, a Conveying & a Secreting Branch, and the Secreting Ducts terminate in one. That it would be better to inject from the Duct than from the Artery, or at least, that we would be as sure of knowing the structure in this way. Out of Genl. Indo Mallers work you will find no one has thought of that, and he himself is so far from doing any body to do so, that he gives an argument which should render this unnecessary, for the says there can not be follicles, because if they are as big as a halfpenny concern'd wy as large as a big pin, the Artery from which the secretion is made being very small, it would not have force to drive the liquor thro' them. Or that the force would be 2000 times less, that is supposing every follicle to have been an Artery for it to do it, and

and that one duct coming from it. I mention
duct experiments in My Thesis 1753, but it always
occurred to me, that there was nothing to prevent
every follicle to have a thousand ducts
terminating in it, and that therefore the force
with which the liquor was moved, was considerable
or at least sufficient. To suppose a number of
arteries terminating in one follicle, and but one
duct from it, We shall be able to fill the follicle
from the duct much better than from my arteries.
The duct being larger — and accordingly I have
demonstrated the Weakness by Inversion, nor
from the duct. Now, what I knew to have been
seen is that. Some have reasoned falsely on
Repeating these experiments as Mr Thomson
who alledges that the follicles which he saw

1129. in this place, minute Vessels have lost, & making a Bulk. Now instead of this, I know that they are to be seen distinctly, as uniform bags in the first Moment of making the preparation, so there is no Deception from a number of them being thus together, & putting on a round or smooth shape. Nor are we deceived by the bright colours of the Vermilion as by Mercury. Nay, I would observe by the eye, that a Wax injection is much more penetrating than one of Mercury. Such as an Anatomist uses, pouring it thro' a tube, and I cannot fill the follicles with Mercury, which I do very readily with Wax. I can fill from the Duct every lobule of the glands, without extravasation and without using force. In some glands I can trace the follicles from the Arteries, and also

in other, I can make an injection, hard to
go, yet I make it enter the Tube more easily
from the Duct than from the Artery: or I can
make it hath more readily from the Artery into
the Duct, than from the Duct into the Artery. so
that there is somewhat placed at the very begin of
of Excretory Ducts of Glands, which, resisteth the
easy passage. So I have dilated the Urinary
Duct, & Glands after inducing Jaundice, but I
would not squeeze back the Bile into very Mass of
Blood, therefore tho' we dilate the Glands part,
yet do not enlarge the communications with
the Arteries. so there is no doubt that there are
requisites between the Arteries and Ducts, for the
Mammae they are larger than in mostly places;
in the Testes, and Prostrate Glands they are very

1131. very minute, in the Salivary glands of their size is more considerable, and they very much resemble the cells of the lungs, and the several receptacles for the saliva seem to communicate, and the Duct is like the beginning of the Trachea from the lungs.

Now, after this knowledge, can we explain the function of Animal bodies? I apprehend we cannot. Nay, perhaps never shall, tho' we could trace every Vessel from its beginning to its termination. The changes depend on a variety of circumstances, & perhaps it will ever be impossible to determine how much every circumstance contributes, but we are to join a number together. We see the whole course of the blood, from the Arteries to the Veins by the Microscope, and tho' the change of

of our food into blood, depends much upon the
gent motion, yet we cannot say how it happens.
Therefore, every we are to conjoin many circumstances,
and to each to allow a certain share. We find ye
glands disposed in a regular manner, some near
to the Heart than others; We find the angles of the
Arteries which enter them likewise greatly reform.
So in all the Renal, they come off at Right Angles;
We also find the glands supplied by Arteries of very
different sizes, or a much greater quantity of blood
circulating, and the secretion from it made much
quicker in some than in others; so also ye com-
-munications between the Arteries and Veins of
one gland, more remarkable than in another,
so an infection passes more easily between ye
Renal Artery & Vein than between those of ye brain.

Brain. Next, We see a variety in the situation of the glands, and in all other circumstances. Thus, the Spermatic Artery in a Quadruped is much convoluted; and the Liver in all Animals is supplied by blood which has passed thro' more Vessels than that entering the other glands; and in Fishes where there is one circulation in the lungs, then a second thro' the rest of the Abdominal Viscera; the Liver receives it in the third Circle, or the Veins meet to form the Vena Portarum as in Man, so We surely cannot imagine, that the blood in the Vena Portarum is more fitted for the secretion of Bile, than that which enters the Kidney. Next, we must take into act the number of branches into which the Artery divides, the angles of these branches, and even the Mick=

thickness of these coats, which is greater in some than in others, and in the ultimate divisions there is a variety in the turns & windings and in the diameter — There is likewise a difference in the sensibility, and all depending the living and contractile power, may be collected to act in a variety of ways, and there are perhaps other circumstances which entirely escape us. Nay, besides the mechanical effects owing to the causes I have enumerated, there may be some chemical changes, if we find the same as by a process called fermentation putting on very different appearances out of the vessels, a process resembling that in many circumstances may operate within them. But the nearer we come to the knowledge of ye structure our views will be clearer with regard to

the manner in which the Glands operate, & the ways in which they may be exposed to disease.

Lect 84th

Now that we have examined the structure of all the Viscera, and Glandular organs, we proceed in tracing the Arteries from the Pelvis downwards.

Lect 85th

The Veins of the Inferior extremities demand

Lect 86th

The Muscles & Nerves of the Inferior extremo to much resemble those of the Superior, that most of the remarks which would occur here in view of the leg alone, are in a great measure anticipated by what was formerly offered when explaining the structure of the Superior extremity. Still however such things arising from situation and connection will merit attention, and follow

following the order of the Demonstration, let us first keep the Arteries in view, and we shall begin with the Trunks from which they are given off, the Descending Aorta. This you have seen so closely applied to the Spine, or so firmly supported behind, that the whole dilatation and motion of it is forward; and hence in very lean exhausted People of have Never been able to distinguish the Stroke of it here Externally. And this has led Surgeons in some of these cases to apprehend a Regurgitant Aneurism. If you lay an Emaciated Person on his back in bed, saying his shoulders a little, the Abdomen yielding thereby somewhat inwards you may Externally feel the Stroke of the Aorta. And this may be of Real use as it supposes that a large Artery of the Extremity be accidentally or Surgi

1137. Mortally wounded, I apprehend that in such Persons it is practicable by a Tourniquet and Bell applied to restrain the current of blood, and lessen the force with which it is thrown out.

Tracing it to the bottom, we find it divided into two Branches which are perfectly equal, so that no reason appears from the division of the Vessels, why the one ly should be preferred to the other; and hence perhaps we very readily learn to give the preference to the Left ly, when an accident happens to the Right Leg. We do give indeed that the Right ly is somewhat stronger than the Left, but that is perhaps from habit, and I much doubt whether the Children have that preference in the same degree. The two Branches mutually make a turn in the cavity of the Pelvis, for if

if they had been over it, the weight of ye bowels would have been in danger of compressing them. whereas the turn at the side gives them ye support of the Muscles for ye Psoas. From the origin of ye Angle of blood descending rushes wt violence against the Angle, and perhaps on this account we find that that part of the Aorta next to the origin of it at the Heart is the most subject to Dissects, so we have frequent examples of Ossification at this place. Assume here the Vessels dividing equally and into two branches only, and support is given of comparing the origin of branches with the Trunk, for we immediately find a division of the Iliac a communis into Ext. and Internal. Now, from the view of these Gen would Judge that the proportion laid down by Haller & Cyrs is

is nearly just, i.e. that when an Artery divides into equal parts, these compared with the trunks are in proportion as Three to Two.

We next follow the shorter branch, the Internal Iliac, and first observe a vein from it, & proceed to the Femoral two veins, the Uterine, and the Vaginal. Both these branches chiefly exhaust the Body of the Uterus, & does no more than the Spermatic, which runs first on the Ovarium and only reaches the Uterus afterwards, and from the extremities of which chiefly proceeds the Menstrual flux. Hence a proposal has been made in order to promote this evacuation, the making an opening on the External Iliac, upon the Femoral Artery, in order to increase the Momentum in the Internal. Now, tho' God not

not expect as much from this as the Gentleman who has proposed it in the 2d Volume of our Phys^l Essays, because I dont find that a mere increase of the force of the blood immediately brings on ye flux, yet the proposal is rational, and we may at least by such a pressure, and some cases may be more partly adapted for this expert than others. I have in some cases proposed that it shd be done, but I cant give a satisfactory account of the effects, so many trials are necessary, and so many circumstances vary the effect of every trial. and perhaps in many cases the directions might not have been properly followed. But as the experiment is simple, & can have no bad effect it is worth pursuing.

Next We observe an Artery common to both faces

1161. The Arteria Pudenda communis which in its passage to the Organs of Generation supplies the extremity of the Rectum, the common seat of Hæmorrhoidal Tumours, and the corresponding Veins return the blood into the Internal Iliac or Cava. So I will find a necessity for discovering some other cause for the disease than that generally assigned for the frequency of the Hæmorrhoids. In both sexes the situation is not only similar but singular, the pudendal Artery lies between the Levator Ani & the Sphincter, wth an accom=panying Vein, but this smaller in proportion than the Artery, and here contrary to the common rule. The Veins are more superficial than the Arteries. So some particular purpose is intended, and we are enabled to account for

for the distension of the Corpora Cavernosa both of the Penis & Testes. Next, we find branches of the Internal Iliac entering the holes of the Os sacrum, and these are dispersed in the lower part of it; and hence in making experiments the Ligature in the descending Aorta, or in the Iliac Arteries has a remarkable effect in bringing on Paralysis, and I shall prove more fully afterwards the importance of Arteries accompanying Nerves. We next find a Branch running down the origin of Peroneus Nervus, & other Branches sent off backwards particularly one wth the Sciatic Nerve.

We are now able to judge better than formerly of the places where Hernia will most likely happen — Whenever a chord of Vessels or Nerves

114 D. Run out, the connection must be loose to allow them to accomodate their situation to ye flexion or extension of the body. Hence Hernia commonly happen at, the Umbilicus thro ye thing of the Abdomen Oblique called Inguinal or rather Scrotal in the Male; or thos where the Hernary sac follows the Femoral Vessels — And Jno add new two other places viz. The Foramen Thyroideum, and the notch of the Os Ischii behind; of the former kind we have about Twelve examples, of the latter very few, on account of the Tendinous Membrane about the sides of the hole, & ye thickness of ye Gluteai Muscle. Next, We remark that those last named branches of the Iliac Artery, descend a considerable way upon the Abdomen — We see the Abdominal or Epi-

mia

meeting its Branches with the Circumflex and the Scheiatic descending on the outer side, while the branches of the External Circumflex are evidently recurrent. In most subjects we can by Dissection very clearly shew their communⁿ i.e. those are so small - But in all subjects I am convinced that the communications are numerous, as we can make an injection pass from the External Iliac into the Internal thro' them - It is material to observe this, for it shows the possibility & even probability of saving the limb as well as the life of a person when a Wound has been made deep very near the Trunk, or we are enabled to assist by what I proved with respect to the Arm, that the principle Artery of it may be stopped,

1145. or tied as high as its origin, and of a sufficient quantity of blood furnished to nourish & amend. When these few years we find gradual proofs of this. But the experiments have been made on the Middle of the Thigh, so these will come in afterwards.

When speaking of Aneurisms in general, we found that they were most common in the great Vessels near to the Heart — But we are by no means to lay it down as a Rule that they only happen here — I have seen several cases of their occurring in small Arteries, and in one instance I have seen an Aneurism formed, when the Scalpel Nerve burst down, which occupied as much of the Tegaments as one can cover easily with the hand. The Bulk was formed before

before the Patient was aware of any sort of uneasyness, Nor was he sensible of any increase for a considerable length of time. So after considering the case We determined Not to hazard an op.n, Because of the uncertainty of the beginning of the Tumour. We endeavoured to search for that by feeling the forepart of the Pelvis, and introducing a finger into the Rectum, where We found no unusual Pulsation. But I might have come out from the Pelvis in a Conical shape, besides there would have been the Utmost difficulty in the time of the operation, in making compression. And therefore it was in this case I thought of compressing the Aorta, & of examining y.e pulsation of it in different ways. And this difficulty arose from the Vicinity of the Artery to the Peritoneum,

that

 That the coats of the Aorta might have con=
=tracted an adhesion to it. To I gave directions
with a view to prevent the rapid progress of it, by
moderating the circulation of the blood, that he
should avoid exercise, & all violent efforts; But
I expected that in a few months the Tumour would
enlarge so much as to burst, but it still remain
nearly of the same size as at first — I was of
opinion that if the Ligaments had become
affected, then the bursting of them should not
be hazarded, but immediately to have recourse
to the operation. Now, from this case we see
the possibility of Aneurisms forming without
an evident cause in small Arteries; And we
also see the caution necessary in making the
Prognosis, that the disease continues longer with=

without change than we would expect. Mad.

I have in like manner attended a case, where the whole Menum was split by an Aneurism, & the bone ulcerated, & in that case the increase was extremely slow. Still later I have met with a case, which surprised me more than these — a Tumour formed in the Neck, from the very first appearance had every marks of Aneurism, and when I saw it, it was of the size of a Turkeys egg. And since that time has gradually shrunk, and the Patient is now well. We may be mistaken by other Tumours forming near to an Artery, and receiving the stroke of it, but seldom these undergo some further change — after the humour has acquired a certain size, it seldom pulsates, unless it is of an Aneurismal kind.

Next

1149. Next, We follow the External Iliac, which runs a great way without any Lateral branches, then it is a very good subject for Experiments on Arteries. Soon after it gets behind the Tendon of the External Oblique it sends off the Epigastric and Circumflex Arteries — The situation of the Epigastric Ligamat on account of the Danger of making a cutting in performing the operation for the Femoral Hernia. Then the Artery comes out into the Thigh covered with the Aponeurosis over the Muscles, and soon after the Inguinal Glands are laid over it, and the situation of these is carefully to be attended to, especially that you have seen that the Artery runs nearer to the Surface than the Vein, contrary to the common rule. In Venereal cases, where Buboes form, there is

is surely no necessity or argument for having recourse to any operation which has been practised of extirpating the Bubo by Incision; But in other cases where the Matter is of a Nature that cannot be treated by Medicine, such is the matter of a Chancre, we ought with the original Disease to extirpate the gland, whereby we at least lessen if not altogether prevent the infection of the blood. And in such a case the Kidney will closely adhere to some of these glands, not only in consequence of the increase of size, but of the Inflamm^n which attends it — Now, suppose that we are treating a Venl case, Caustic is freq^y employed for the opening of Buboes; But from a number of cases which I have seen, where they did well, where Matter was merely discharged by

by the bursting of the Tumour, if it should
be near to the tender part, I am doubtful whether
larger openings be at all necessary. But granted
that they are, we may if the Tumour be large
safely venture provided we confine it to the
surface of the gland, for it may spread further and
eat into the side of the gland upon the large
Vessels, and at least weaken their coats. Still
more we should avoid venture where already
sinuses have formed, because from these it may
go to a considerable depth — Therefore Caustic
or Knife seems to be preferable.
At this place I was particular in remarking
the situation of the Vessels and Nerves with
respect to the Joint — I showed that though
the

the blood vessels passe over the head of the Os Femoris, & the immediate cavity of the Acetabulum, yet there is a possibility of thrusting the neck of the bone further out. Or I mean to shew the possibility of making incisions into this Joint, which may be done with propriety. In one case I found a quantity of dark green coloured matter within the Ligament on the fore part, on examining the Pelvis I observed that a matter was diffused within it, the bones being corroded and deprived of their Membranes, and I can remember the thinness of the Acetabulum. Therefore Mr James from consid. of the opening into Joints as a Matter of little consequence considering the Insensibility of ligaments, but it is better to give the matter a discharge than to

to the connexion of the Ligaments, which from the dividing in would have the same bad effect as in the cutting of bones that the Mallet may erode the Bone, & get within the Pelvis, and as the Ligament does not merely include the Round Ball, but descends to the bottom of the Neck of the Os Femoris, an incision can be made with equal almost safety, and in the very place we would choose, at the lowest part of the Joint without the tendon of the Internal Obturator Muscle, and within the Head of the Sartorius, so at a very sufficient distance from the Nerve, as well as from the Artery, and in that part of the Ligament which includes the Cavity.

We now follow the Artery ~~and~~ over the Vein and find it going off the Profunda Femoris, with

which perforates the Muscles, then descends to the Joint of the Knee, & especially communicates with the Trunk of the Femoral Artery. Following this further it passes thro' the long head of the Biceps Muscle, which passage is carefully to be observed by Surgeons because it happens to be where Amputation is frequently performed, & where the Artery may by shrinking within ye Muscle, make it difficult for the Surgeon to lay hold of, as the Muscle is slightly fixed to the Bone, but if in this case we cut the Muscle away from the bone, the Mouth of the Artery is readily seen. In this place we again see branches shoot round the Joint in a circular manner, resembling ye branches as above the Elbow, tho' they have less the appearance of recurrent. Besides these

1155. fundamental, Anastomosis from the number of communications more especially formed about the Middle of the Thigh; and I have alledged that every conclusion with regard to the Superior, may be applied to the Inferior Extremity — And of late years We have 3 or 4 Cases where the Femoral Artery was tied up, and the Limb saved, contrary to the common Rule of having recourse to Amputation provided the Wound was entirely in the Trunk. Instead of Amputating in such a case, let us attempt to save the Limb by making a Ligature — I cannot say that we will succeed in a Recent case, where no Ligature on the Trunk has been made for a length of time as well as in the case of an Aneurism. In Dogs where I have made the experiment

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some commenced the operation, while in others the limb mortified, but we would only proceed to amputation in the last extremity."

When the Tourniquet today, I got behind the Thigh of the Boy Tenor it is impossible to the Tourniquet where course, and very near to it, and it was the same when it gets behind the Hamstrings, so that we can by a Cushion bigger, squeeze it against the bone and stop the blood in it, on all its course we should only apply a Tourniquet, and if the Boy is not thin we may feel the stroke the whole way down. So we vary the place of applying the Tourniquet according to the situation of the part to be amputated, if it is above the knee, we put the cushion into the Hollow at the inner side of the thigh, for tho' we could place it higher, it would be difficult to place

1154.

place the Bandage - If again the Operation is to be performed on the Leg, We do not stop the Circulation in any greater part of the Member than is necessary, to apply the Cushion between the Many Rings.

Lower than this you see Branches very much resembling those We observed in the Head, the Radial and Ulnar, and the Tibialis in some measure resemble the Median or Interosseous Artery of the Arm - and We find a similar Arch in the Foot, & many smaller communications to guard against Obstructions, so We may draw the same conclusion here, that the may tye up any of these Arteries when Wounded, without preventing a free circulation, or that the Operation of the Aneurism may be performed with Absolute certainty of Success anywhere under the Knee.

Lines. Next Have both a fair Sweep & [illegible]

1159. of the Vessels. We find these as in the Arm and
other Muscular parts of the body in gen.l Two sorts of
Veins, one accompanying the Arteries, and the other
Subcutaneous in the Arm, because the Muscles are
less varied in their action, as we shall see in motion
of Rotation in the Arm, and when the blood flows
thro' the deep Veins with greater difficulty hence
Subcutaneous Veins are larger. Next, if from the
greater size & Number, the Dividing of these Veins
must be attended with more Danger than a simple
Division of those of the Arm. So we find directions
given after an Amputation of the Leg and they
to make ligatures upon the Veins as well as upon
the Arteries, especially if the Amputation is made
above a pair of Valves, & there are many Crural
Veins coming between those & the next pair.

Follow=

Following the Veins higher, we find they sink deeper than the Arteries, & that the whole way, probably because the Veins within the body would have been less able to bear the weight of ye bowels than the Arteries. So the Vena Cava & its branches are less subject to compression behind the Arteries than if you were to suppose the situation of the two Vessels changed.

The last Observation on the Vessels is, that their Coats are evidently thicker than in the Arm. So the force of the Heart is not so enormous as many Authors represent; since there is a greater thickness of the Vessels where there is only a few Decimal feet of height of the Column of blood. The use of this thickness is evident. You know we are subject to two Diseases more especially in the Inferior extremities. First the Effusions of ye Thorax, & of

of the blood, or to Oedematous swellings, which I explained before, that the Circulation is increased by the height of the Column, and the return made more difficult by the number of parts acting upon the Veins, as they ascend up to the heart they are subjected to the Distended load of the Bowels, and even our Stiff cuticles. And in the length of these Veins the blood may undergo some change which may make it move more difficultly. For in a Case of Varice, I found behind the Valves on the top of the Femoral Vein considerable Clots of Blood or Polypi, so that I cannot help thinking that Concretions may more Readily happen from the length, and to this we may add the Difficult return of the Lymph in the Lymphatic vessels. The other Disease is Varicous swellings of the Veins, which is much more frequent in the

the lower extremities than in any other part of the Body, and they sometimes burst, and pour a quantity of blood into the Cellular membrane so that there is sometimes a necessity of taking it out by Incisions. If there is no effusion, by proper posture, and Mechanical pressure, as by a Laced stocking, and by stimulating at the same time the Veins in their course to make them recover their Tone, we may do service, and if the Disease does not originate from some accidental pressure or Circumstance of the Veins, but is occasioned by Tumours forming in their course we have Mercury with advantage. So in Cases where the Varicis has encreased to a great degree a free course of this Medicine has been found to remove the Disease entirely.

With regard to the Nurses I have little or nothing to

to observe, as they correspond so exactly to those of the superior extremities. The trunk of the body is supplied by a number of small branches running backwards, the same muscle receiving its branches by numerous roots. Going lower in the body we find the nerves in the loins joined together like those of the neck, only as one part runs before and the other behind, we have a more obvious view that nature does not study to supply the flexors from one nerve, and the extensors from another but both are supplied from the same root. Tracing them downwards, I took care to point out their situation with respect to the blood vessels that you may avoid them in performing operations, as incisions, or where after an amputation you want to secure blood vessels.

Me

We find the Anterior Crural at a Distance from the Femoral Artery, as also the Sciatic Nerve, at a sufficient Distance. In the Leg there is greater difficulty, as they adhere more closely, & especially the Nerve which runs along the Anterior Tibial Artery, and sends a number of Branches adeuxfs. And here if the Surgeon cannot detach the Nerve let him include such a Portion of the soft parts as will serve as a protection, and it is not necessary that he should pull the Ligature wth all his strength, for the weight of one's arm is sufficient to stop the Pulse, so I have known the Plaintiff's Double Bow make Ligature enough to have this effect, so much less Degree of Compression is necessary than we are aware of and we are not to imagine that any Injury a Nerve is not an additional injury to it, for it

1805. it has a worse effect than the Division of it.
and is of use to attend even to the Branches that
are of secondary size, as to these in the hand, as
may occur where we may apply our knowledge
with advantage. One Officer struggling wth and
fell on the outside of his leg, so that the knee bone
was broke to pieces; from that moment he had a
strange coldness & numbness on the fore part of
that leg; he could extend the foot, but could not
bend it again; could bend the toes, but could not
extend them; and there was a want of power in
all the Muscles on the fore part — so that the
Complaint was owing to the pressure of ye Inferior
Nerve against the bone — therefore all ye applications
were directed to this — Blood was drawn by Leches,
Blisters were applied, and fomentations; and
by

by these measures, in time he recovered a good deal the use of the Member. With regard to the smaller Branches, we would apply every thing that has been said of the superior extremities particularly with respect to Wounds in the Foot, the necessity of avoiding the course of the Nerves by keeping the Middle of the Foot — or of education of matter direct to the side, let us recollect the situation of the Trunk of the Nerve, and try to get behind it. In like manner whatever degree of Danger attends the Wounding the Subcutaneous Nerves of the Arm in letting blood there, must also attend the opening the Saphena near to the Ancle. And I find proofs of this in a very tolerable book By Mr Gallaway on Amputation — He gives us several examples where a mortification was brought on the foot from opening the Saphena major

[illegible]

1167. near to the Cecum, where we know there is no Aponeurosis or Tendon to occasion this.

Lect. 87th

You have now seen fully, the Distribution of the Nervous System, so that we are prepared for considering the Nature & properties of it — But before proceeding to that, I find it necessary to give some Genl notices of the manner in which Medicines act upon the bodies of Animals. And as the experiments made for that purpose were done on Dogs I find it necessary to bring to your, that in every important circumstance, that Animal corresponds with Man, the Circulation is carried on by the same Genl means, and the Nerves are in like manner distributed. The Circulation differs from that in Man, in one Genl circumstance only, that not the whole but a part

part only, about 1/3 of the Blood passes thro' the
Vessel which receives the Air, or the Lungs of the Frog.
I chose the Subject of these experiments because this
Animal is remarkably tenacious of Life. Thus after
the Heart of a Frog is cut out, the Animal can move its
body from place to place for more than an hour, and
in like manner in consequence of that Although We have
up a principle Action of any Member, the motion of
it continues for a great length of time i.e. Nerves
preserve their power over Animals for a long time
independent of Circulation. And after the motion of
a Member has ceased it remains sensible, so that if
Animal shrinks when any further injury is done
to it. On the other hand, Where we divide the Nerves
of any organ, suppose the Sciatic Nerve, and all the
other principle Nerves running to the Inferior Extremes
which are easily found where they issue from the

1169 the Spinal Marrow and that the Animal instantly loses all the powers of Sensation & Motion in the part, yet the Circulation remains in it rapid and free, and so things may continue for a long time. We often then an opportunity given for determining how far certain powerfull Medicines which operate quickly, have their effect thro' the Nerves, or thro' the Fluids, or thro' the Medium of Vessels. And in order to be more clear in our Conclusions We ought to know the effect of the Medicine on the Animal when entire. For the present purpose I shall mention chiefly the effects of Opium — I found that this Substance had at length the very same effect upon the Animal in whatever way it was applied, whether taken into the Stomach, injected into the Medium, or applied to a Surface of the Body, excepting only that in this latter case a great quantity, and a longer time was

needs-

necessary to have the same effect.

Having observed then all the circumstances by which the operation of the Medicine could be Distinguished in the sound Animal, I next endeavoured to prevent their influence any other way but thro' the Nerves alone — Now to do this, or to prove that the Nerves convey the impression, I first intercepted the circulation of the blood, cutting out the Heart, by means of which all communications from the Pels was immediately prevented — I then applied Opium to different parts of the Animal, I found that when it was applied to the distant organs, as the Extremities of the body, the Animal could not be very sensibly affected; But on pouring the Medicine into the Cavity of the Abdomen, in a few minutes the most distant Fibres of the body were deprived of their power; i.e. one Nerve is brought to suffer with another in=

1771. independent of the Circulation — But I find I can remarkably unhinge the whole Muscular organs of the Body, by touching the Surface of the Heart, having instead of cutting it out, stopp'd the circulation by dividing the Aorta, the only Artery which comes out of the Heart of a Frog — I then made a small hole in the Cavity, and poured a single Drop of Laudanum I mean Opium Dissolved in Water, and as soon as it touch'd the Heart, it was deprived of its motion, nor could I excite the smallest Degree of Vibration, tho' I poured it with a red hot iron; and in a few minutes all the Muscles which would have retained their power for an hour & more, lost it. So we perceive from these experiments, that there obtains a sympathy among the Nerves, that thro' a single one we can disorder all others in various Degrees perhaps.

Now;

Now, let us see how far we can prove that a Medicine disorders the body by entering first the Absorbent system, and afterwards y Circulat.

After what you know of the circulation continuing in a Frog long after the Nervous Influence is destroyd you see the ready way of trying this experiment, and you are aware of the effects it may have in that manner; for if a single drop of Opium touching the surface of the Heart, deprives that organ & all other of action, in a short space, a small quantity mixd with the general Mass, may by acting in the manner produce the greatest disorder, not merely from changing the fluids of the Animal, which has been the common idea, but by acting on the insensible parts of the Circulating system.

Accordingly, I found that applied to any part of the Nervous power of the organ was destroyd, it disorders the

1173. the most distant parts, almost as soon as when the Nerves were entire 12. The Medicine operates in a very powerful way by entering the mass of blood. So when we take a dose of Opium into ye Stomach, we are not to conceive that the effects depend solely upon its action on the Nerves of that organ; But if the Dose is large, & has been for some time in the Stomach, it operates in a considerable degree by its absorption into the Lacteals, & its mixture with ye gen^l Mass. Or upon the whole from these experiments (which are published in the last Volume of the Philosophical Essays, where you may at pleasure consider all the Conclusions I have drawn from them, Prove that we suffer in two genl ways, and that the operations of Medicines are much more various and extensive than is commonly conceived, for besides the immediate effect on the part touched, we

Influence conveyd in a manner
We do not understand, thro one Nerve to another.
Next, it may be assumed into the general course of Circulation
and Disorder the principle parts of the Circle thro wh
it passes, particularly the Heart which possesses a most
exquisite sensibility, which extends in like manner
into the Arterial System, for when the inner side of the
Aorta is touched, all the parts sympathize with it.
Next, Medicines not only have their effect as floating
in the gen^l circle, but some are disposed to affect
one organ more than another, and the same is true
of Diseases. So the matter received by Contagion irritates
those organs chiefly by which the acrid matter is
naturally thrown out of the body. Thus y^e Measles
and Small Pox affect chiefly the Pituitary Organs. Again
when a particular Organ is influenced by y^e matter

or

1175. Medicine concentrated by sympathy, it may dis=
=order others in very different ways.

Let us next consider the structure, and properties
of the Nervous System. You all know that the Nerves
of the body are the continuation of the Medullary ts of
the Brain, which are lengthened out to the most distant
parts, and parallel to each other, and are without
communication if we except the Ganglia, where the
straightness of their course seems to be intercepted.
The use are enveloped by certain Membranes, the use of
which I shall consider afterwards, viz. the Pia Mater
Arachnoid Coat, and Dura Mater. When we applie
the Microscope a further division appears than
we would anticipate, judging by the naked eye, but
how far this subdivision may extend is impossible
to determine. Leuwenhoec observed that the most
minute

minute fibre resembled a large bundle, so that he was not satisfied that he was looking on a single fibre, but that probably he had in view a bundle of smaller fibres; and I endeavoured to prove from a very plain calculation, that in our Eye-lenses are formed of Objects the Diameters of which cannot exceed the 20,000th part of an Inch, yet as in the Object we perceive various parts, we must suppose that more than one thread at the bottom of the Eye is impressed by the Picture. Next, we are at a loss to determine the genl Nature of these threads, the smallness of them creates yt greatest difficulty — since yet find Physiologists in their opinions of the Nature of these; some considering them as solid cords acting by Vibration, like the strings of a Musical Instrument, while the greater number reject this opinion, and conceive that they are

1178. as hollow tubes either convey, or by a power proper to them conduct a fluid, and some have fancy enough to imagine that which as tubes they convey one kind of fluid, upon their surface they conduct another upon the whole, it is by far the most probable opinion that the nerves operate by conveying or conducting a fluid, for there are many objections to the idea of their acting by tremor. They are in every respect unfit for this. They are composed of the softest in the human body, for such surely is the medulla of the brain, and which is very little fitted for tremor. We find them next tied together, or a vast number of threads in the same bundle, so that the tremor of one, we must suppose would disturb the neighbouring threads. Then we observe them sending off numerous branches on all sides, and

and similar sensations & motions are produced by Nerves of very different lengths. And when we look to a Nerve dispersing its influence, with glasses, not the smallest degree of motion can be seen in it. Such an Idea then is repugnant to what we observe every where else in the body of the animal, we find that substances produced from organs into which blood enters in great quantity convey fluids. Lastly, we find that a pressure made on the Nerve any way in its course, interrupts its influence, yet the mere pressing in tying a ligature upon a Nerve should not do this was the effect produced by tumor; so that opinion upon the whole appears improbable. I would therefore allege as the most probable reason, but for from being certain, that the Nerves contain or conduct a fluid, but I would avoid attempting to consider the nature of it, like Wilkins a view

1100. of the Offices of the Nerves, which are beyond all Doubt to render us sensible of Injuries Done to the Body, and to enable the Animal to act with its Muscles — Many eminent Physiologists add a third Office, That of Nourishing the Body. The former are clearly proved from the Experiments I have already mentioned, so that nothing can be more certain than that the Offices of Sense and Motion are justly ascribed to the Nerves — That they are to be considd as the Medium between the Living Spirit and the Corporeal, Not perhaps that we shall find that the Nerve lodges the feeling principle in its Course, it is perhaps merely a Medium, and that point will come afterwards to be Considerd. But as for the third office assigned to the Nerves, That they nourish the organs directly, I find not the smallest argument in favour of it, this opinion seems rather to proceed from a

a want of reflection, and as it is a matter of great consequence, I shall endeavour to state what has been said on both sides, that before I enter on the argument I would point out the necessity of receiving such an opinion with the utmost diffidence, because it seems to be a purpose it have some other favourite system in view. They are struck with the analogy of the Nerves to the strings of a lyre, and they have not ventured to deny that the Nerves convey a secreted fluid, but have admitted that as it is performed by the Brain, and they wish at the same time to prove that a secreted fluid is totally unfit for answering the purposes of Sense & Motion, particular is created how to get rid of the secreted fluid of the Nerves, and some further purpose must be assigned to it, and that is to Nourish the body. New Men may take this to be in a great measure the history of this opinion, but no matter whence it has originated, let us see if it

is well founded. The argument alledged for it are these, that the Brain of Animals exists before the Heart, that the one can be easily demonstrated before the other. Next the Members grow weak of their Nervous power, or in a Paralytic state shrink greatly from, say they, a want of Nourishment conveyed thro' the Nerves; and then the person is mentioned that Nerves convey a fluid, and that this is unfit for Sense & Motion, and frequent proofs are given of vast infidelity in its motions; and it serves not for Sense & for Motion, it must serve some other purpose, and the early one I have conceived it Nutrition — Now, I would be extremely willing to treat as Offend, an opinion that by Men of ingenuity and fancy the idea of the Brain seen shine before the Heart is merely so — Look into Haller who has treated the evolution of the Foetus, and pointed out every change, he mentions the size of the Brain, soon after

the

the incubation of an egg begins, after thirty hours, the Brain is seen, the means the Head — for on the 8th day of incubation, the organization the Head does not appear, as you have seen it opaque, while in its Medullary part and Cortical without, but here it is clear like water, and as soon as the head appears the Chest is seen, so I would say Dr Haller saw the Heart as soon as the Brain — But not to rest on such vague argument, in the end of the second day the Heart appears, sooner because it was transparent, just as we with Microscopes see only in the transparent parts of animals the red particles of the blood in motion, the intermediate spaces are filled with vessels conveying colourless liquors, but which escape our view — But tho' we have no view of it, the Rudimentia of all Animals are so minute as to escape all observation, at the instant a Fœtus begins to live within an egg, not only the

 The Brain is invisible from its smallness, but the whole body — Now Can the Brain grow without the Heart? Manifestly is very absurd to suppose this, for it cannot grow without an addition of blood unto them and as the Arteries convey this to the Brain, upon taking away the Heart, the Brain must remain without further growth, Without at all adding Thus the Brain is as well without Cortical matter, and a vast number of Fibrils, and We cannot suppose these to exist without the Heart, or the Medullary part of the Brain without the Cortical, nor to grow by any power inherent in it, without a power Ab Extra. So the Heart exists from the beginning, the evolution of all the other depends upon its power, and of the Brain in common with the rest — And the only observation to be made here is, that the Brain Arteries of any young Animal are larger in proportion than those

those of an Ideot — The Fibres of the Brain are very complex, It serves two material purposes in a Primary way, and there are others evidently depending on these. Other Animals possess Sense and Motion in greater Degrees than we do, But our Brain is more Complex, and our faculties more extended, and there are many Reasons why the Brain is of a General Shape, or Why that Size & Shape are varied in Different tribes of Animals, Many of which escape us, and by communicating the power of motion, the brain in a secondary manner enables the Fibres to perform their offices, & among others to give Pain &c. Next, as to the general fact, that Palsied Limbs shrink, You must all know it, But I appeal to Gen who have been such cases, If this shrinking has not been much exaggerated, They do shrink to a certain Degree But not to that which fails deserved of Nourishment would do, nay

1185. May 9. I have cut the Nerves of Animals entirely, and
rendered the parts motionless & insensible, and yet after 15
or 16 months I could not from the size distinguish the
Paralytic limb from the Sound one. Then How are we
to explain any diminution of size? I apprehend that the
explanation is easy, for every limb kept from motion
shrinks. Thus if by any accident a Person is obliged
to confine a limb in a certain posture, we find that
it diminishes in size. The Nerves remain free, and
without obstruction. It is needless to enlarge upon an
account of this, the fact is sufficient: but if we add
the want of the gentle motion of the Muscles, which is
occasioned by the Confinement, the want of activity
every fibre of that Muscle & every vessel of it, that
that the Arteries are less actuated than formerly, the
absorbent Vessels must take place to a greater degree,
and the Nerves do not convey the stimulus, & circulate
the

being left, they carried on, & all secretions by [illegible]
or improperly applied. And not upon that, in this country
at least, alledged that the Saliva comes from the Nerves,
yet if not the Nerves of a Salivary Gland, the secretion
is lessened because the activity of the vessels is diminished.

As for the third argument, that a small liquor can
not have sufficient Motion, it falls to be considd afterwards,
But whoever shall prove this circumstance, shall prove
that the Nerves contain no fluid whatever within them
as hollow tubes, now for they conduct somewhat is not
fluid, but they do not as tubes convey a fluid like other
glands, this I can show by direct arguments, first that
the Nerves do not nourish; and Next, that the Arteries
do, perhaps Extremely one of these points might the light
will some third way of conveying nourishment be
thought of. But I will [illegible] it shall clearer to
prove both.

Lect.

At our last meeting we had begun to examine the arguments alledged in proof that the Nerves properly nourish, and I have endeavoured to shew you that there is no just ground for supposing that the Brain suckles before the Heart; for the growth of the Brain so as to become visible is inconceivable without the presence of the Heart. I do not mean to reverse the proportion as a Gentleman meant who has wrote me a card on this subject. He sends an equal absurdity in imagining the Heart to exist before the Brain, and justly so. I would entirely join with him, or with Dr Haller in supposing that all exist at once. That there is merely an evolution of parts, some however appearing larger at first, & grow afterward faster than others. I likewise evoked a Gentleman of

of limbs in Palsy and endeavouring to show that this may very readily be explained without supposing the Nourishment to depend upon the Nerves primarily.

But allowing the Heart to exist as soon as ye Brain, it remains to be enquired, whether ye nourishment proceeds from the Brain or from the Heart. i.e. whether you are to suppose that the food which you know is conveyed by the Thoracic Duct into the general course of Circulation, whether that be immediately applied by the various Arteries of our bodies, which perform such an office for the Nourishment of all ye parts; or that we are with Boerhaave, and his followers, to suppose that the Nerves nourish, & imagine that all the Nourishment first passed upwards thro' the Carotid and Vertebral Arteries into the

the Brain & Cerebellum, and is then extended by the Extremities of these into the Medullary fibres of the Brain, and thro these, as hollow tubes, descends to Nourish the several organs. Now I apprehend that this last idea is to be altogether rejected, there is scarcely the most specious argument on its side, and I am of opinion, that all things considered not a doubt can remain without.

But let us first Raise the arguments which have been alledged from the movements being conveyed thro the Nerves. We take it for granted in the very first setting out, which we are by no means able to prove, that the Medullary fibres of the Brain & Nerves are hollow tubes, and that a function is performed by the Brain, as by other glands &c. The Nerves then have of ancient

accommodate, that we cannot distinguish the presence of such a fluid, but neat, Do we find any necessity for such a supposition. Do we not rather observe that the most crude kind of Aliment is converted by the circulation, with the general or particular part into red blood, globules are formed which do not pass thro' the vessels — We see then a much greater change produced by the circulation than is necessary for converting the blood into aliment — If both the juice of an animal in broth, into the circulating mass, it may just more easily conceive that as the arteries repair the waste with the liquor taken in than the red blood is performed by it, I take another view of it — Now is the waste of the body carried off, either the general current sweeps it from the inner sides of the

canals

1191. Canals, or it is taken up by Absorbents. Now, in either way, we find the Arterious system extended to every part, and the venous corresponding. Or do you observe any particular determination of the food of Animals to the Brain? surely not. Or do we find that the parts grow in proportion to the size of the Brain in different Animals, or in proportion to the Nerves they receive? Do we find the sensible organs growing more than the Insensible? We find a quick growth in many organs in which we can scarcely demonstrate sensibility. Now, to add an experiment, I have repeatedly divided the principle Nerves, as the Sciatic in Frogs, and kept them for 18 or 20 Months, the limb remaining all the while motionless; and in those experiments I have preserved the union of the nervous threads;

or I have cut the Spinal marrow about the middle of the back, and rendered all beneath insensible, and yet I could not distinguish a remarkable demunition in the growth — Nay in these very limbs, when the bones are broke, or a loss of so is made by cutting out a portion, it is readily filled up in the insensible side of the Animal, as in the sensible. Now let us take the other view of it, and see what we can say in proof that nerves nourish. I have already observed the probability of it from the nature of the food in the first mass, and the case with which the food may be changed into Nourishment. But next, we find the nourishment varying extremely according to the nature of the different organs; as has the other functions differences in their properties, so the fluids from one organ, and the fluids from another

1193. and Lymphatics from a Second Fee — Now, why admit that every one of these Secretions proceed from the Arteries, and yet entertaining a Doubt with regard to the nourishment why this one exception to the general Rule? Are the Arteries not capable to separate the Nutritious part from the Mass, in short as the Particles of the Bile, they can generate the idea of Secretion & of Nourishment in many Cases? The Eye grows by the greatest quantity of the Aqueous humour, of the Albumen, or Chrystalline. Do not We unite the Ideas of Nourishment & Secretion? They are perfectly the same — If a Person drinks by a Fever grows fat, We connect the idea of Nourishment, and of the filling up of the Fat — Or may young Animals the Bones grow, Do not We connect the idea of nourishment and of the addition of Earth? Or can We conceive that Water in one substance, Fat in another, Oil, Earth &c are conveyed by Vessels which are uniform in their appearance;

Surely

Surely not. And as an argument, Gentlemen, I shall
Prove that Madder tinges the Serum of the Blood, but yet leaves
the Nerves of their Natural colour, and this Red matter
is in reality the nourishment of the Bones. To take
another view of it, I deprive a part of Sense & Motion,
I then break the Bone, may take out a piece of it, as
also part of the Flesh and Skin, and I find these filled
up in nearly the same space of time as if the Nerve
had not been previously divided, and we perceive ye
Blood vessels running on to fill up the void. Are we
then to say, that the Arteries can form Bone, Flesh and
Skin, but are incapable of nourishing? Therefore I
look upon it, as a point beyond all manner of question,
that the Nourishment is applied by the Arteries, and
that there is no room to imagine that it passes through
the Nerves. I might have mentioned a great many other
circumstances, but I really think it unnecessary. As
what I have offered in Monsieur, that the nourishment

1195. goes on in them, when the want the Brain, ye Glands on which the Nourishment is supposed to depend; and in the Foetus the mother prepares by the Acknes the Nourishment, & it only remains to collect it into the Body of the Foetus. I would therefore confine ye office of Nerves without the Head to what are called Sense & Motion, they serve no other purpose, as far as experience yet goes.

Now, next is to consider each of these singly, that we may form distinct ideas about them, for we are very apt to speak & conceive improperly. Thus, it is quite common in books of Anatomy and Physiology to talk of the Nerves as sensible Organs, that they possess Sense, but when we mean to define accurately, we are to conceive them as being merely the organs that intervene between the Lever i principle, and the Rest of the Body, y^t thro' them we are rendered sensible of injury done the Body, and of impressions made on it

that

But we are not to conceive that feeling resides in the Nerve in its course, more than in a staff or any other so; by which we make ourselves sensible of the presence of extraneous bodies; for it seems pretty evident in the more perfect Animals, as in Man, that the feeling principle occupies a small space in the Head, about the origin of the Nerves, and that the rest of the body is insensible. For we lose all feeling if we intercept the communion thro' the Nerve i.e. if the trunk of a Nerve be tied or divided, tho' you tear to pieces that Member yet no pain is felt. But as there is no end of doubting, I can add that I have made the experiment on the Human body; and after a limb was cutt off, I have divided the flesh with a knife, without the Patient seeming to feel any injury. Now it is necessary to attend to this view, for without it we are apt to be confounded with several things which occurs to us. Thus after an amputation is performed, if we imitate any of y[illegible]

1167. of the Nerves of the stump, the Patient does not feel the pain in the part, but is struck with violent pain in the extremities of the Toes; thinging that seems backwards to the feeling principle, and that refers it to the termination of the Nerve. Hence, whenever we mean to determine the feeling which an wound of any part gives, let us office to mentain an uninterrupted communication with the Brain. One would think this an obvious caution, yet in several experiments it has been overlooked. The other office is to enable us to act with our Muscles. I w^d say that from the Brain a somewhat is sent into the Muscles by means of which they are roused to action, and that without this somewhat determined into them thro' the Nerves, they like the other parts are motionless. For I find no reason to adopt w^t Haller the idea of a vis insita, that a Muscle has a power of

of contractions inherent in it, May, I wd view it as a Machine acted upon by the mind, determining it into the Energy of the Brain — Haller, has been led into a very contrary notion, merely from the expert that the Heart of Animals, or other Muscles separated from the body, continue to act for a considerable time. Now Gentlemen, if the communication with the Brain is entirely lost, you can no longer allege that the mind is throwing the Influence into the Muscle, and therefore it must possess this power as one of its properties. Now, tho' we should never be able to comprehend the manner in which a Muscle that very separate continues to act, yet we understand it as well as Haller can do the throwing the this Inositas, they are both equally unintelligable, for the Nervous power may be as well exerted as the Muscular. Why then introduce a new idea which

1199. Leads to the greatest Difficulties. For it seems distinct
Two powers in the Muscles, a Cord power which they
possess independent of the Brain, and another power of
Contraction given by Electricity — one Agent performing
a Motion and another Directing that. Or to shew this
more clearly than from general argument, then upon it,
That the power is one, You will find Nature encumbered
in Nature which destroys the one Influence, the Brain,
equally destroys the other, or the motion of Muscles, and
again that Force &c when applied to the Muscles, they
most readily Rouse the Nerves to action, when applied
to the Brain & Nerves, do so likewise. You recollect the
Experiment I made with Spasm on the Heart, that
as soon as the inner and sensible part of it was touched
with the Ag, all further motions of it ceased, and the Dis
Insia is quite disarranged. Now, next, Hence if previous
to such an experiment, I divide the bowels of the Animal,
so as to interrupt the circulation, I soon deprive distant
Muscles

Muscles of the power, thro' the intervention of the Brain, either in the same manner as the motion of the Heart, and determined from the Brain by the Muscles. Or if We might indulge an hypothesis, to touch the Muscles with, or the Nerves which run to them, We find the same effect produced, whether we touch the Muscle immediately, or the Nerve, or the Brain from which it receives its influence? So, would Convulsions not be one effect, acting upon the Muscles, the fever remaining however for a certain time after their Separation. I might, perhaps have added some further arguments from experiments, but I have not spread these so fully as to be quite satisfied about them; as that when just the Nerve going to the limb of an Animal, viz, the Sciatic, Immediately applying a very irritating substance to the Muscles of the limb there is a certain degree of motion, but if the relaxing irritating Muscles for a much greater length of time, as for 1 or

Days, weeks, or Months, tho' the Circulation goes thro' them, I have not observed the same degree of Motion. 10 The Muscle moves more readily by the remains of the Influence of the Brain and Nerves, than it does after a certain Period. But upon the whole we cannot doubt of considering the Muscle merely as a Machine acted on by the Nerves; or to explain my meaning by a gross comparison. Suppose a Dried Rope to be stretched round two Pulleys; If I wet it, It grows shorter; I would compare the Muscle to a Rope, and the Nervous energy to the Water influencing it. But are we for that Reason with Boerhaave & others to Imagine that the Muscles are the condensation of the Nervous fibres, that they are the moving extremities of the Nerves? I apprehend by no means. I imagine we ought to conceive them as essentially different from Nerves; that they are acted upon by Nerves, but the composition very different. Because we observe first that in animals a certain

certain toughness and firmness of Muscular fibres is necessary; Surely in this they are essentially different from the Nature of Nerve, which we refer to the pure Medullary part throwing out of the question the Nature of Coats. But, next we see the nerves in their course, excepting in Ganglia, running without form, the fibres laid parallel to each other; How then can the Biceps Muscle of forearm, be composed of a Nerve not much bigger than a common thread running into it? By what power is the Bulk of the Nerve, consisting of Parallel fibres, so increased to such a very great Bulk? You will find it difficult to account for this. But as a much stronger Argument against such an opinion, I find that all the Nerve going to the Muscles is cut, the Muscles lose scarcely any thing of their Size & Texture; whereas if they consisted of the Nervous matter some very observable

Change

 change would happen in them. Therefore we are to consider the Muscles as Machines sui generis. The Nature of the Machine being by no means understood. We not only are ignorant of the real structure of the Muscle, but have not yet been able to construct a Machine that shall in any tolerable way represent its action. Having now attempted to determine the only office of the Nerves without the Head, that they serve to render us sensible of injury, and to enable us to throw the Muscles into action, and endeavour to disencumber ourselves of the idea that any nourishment is conveyed thro' them; We proceed to form a conjecture with respect to their energy or fluid, by wch they operate upon us. I have already hinted the improbability that the Nerves are solid cords, acting by Vibration, & therefore apprehend it remains that We should attempt to determine whether they operate as hollow tubes conveying

Conveying a fluid within them, or by conducting one, no matter here, perhaps when their use all, or alongst their fibrous part. I say these seem to be the genl ideas we would conceive from considering their manner of operation; but to be plain in a little further, I would next set aside a difficulty which has startled many Physiologists particularly Haller, namely, that they suppose a velocity of the Nervous Energy, tho' I do not find any proof of it at least the argument commonly alledged are no ways conclusive. Haller reasons thus. We observe here often that an power to act with any Muscle, then choosing a point as far as possible from the Brain, as the Toes, and calculating the distance between the Brain and the part in motion, call it Sensect. When thus he supposes

1205. That in every motion the fluid passes from the Brain into the Muscle, by which means the determines the Velocity of it. Now I apprehend that to Many of you an oversight in this calculation will readily occur. That the Brain operates a certain number of times upon the Muscle. I have allowed by Designs a Vis insita, But does it follow that the fluid passes at each motion from the Brain to the Muscle. We might as well deceive ourselves in considering what happens in the Lock behind us, where we can make the Water run out many times in a minute, but not every time from the Cistern which furnishes it, but the pipe is always full of Water; so in like manner the Nerve is to be considered as charged with always matter from the one side to the other. You should the

other.

otherwise in touching the most distant extremity, be sensible of the touch. Thus upon touching the toe, the brain has not the nervous matter sent down to it from the brain but the part is prepared for conveying the touch. Or when cut a muscle from the body, and with it a portion of the nervous energy, by means of the muscle performs a determined number of contractions & no more; so we do not find from this argument of Halle's any proof of velocity, and it is evident that the fluid is not of a volatile nature, and that a very small portion of it is sufficient for a very extensive action. Now, are we to imagine as many physiologists do, that a rarified fluid in the vascular passages through the nervous tubes can perform these motions, or are we

1207. We with others to believe that somewhat more speculation is necessary, which they have called Ether, or have compared it to the Electrical fluid. This last supposition, has very lately from the experiments of Mr Walsh on the Torpedo, has gained considerable ground. That Fish is possessed of an Organ, the parts of which are shaped like the cells of an Honey Comb, the Nature of the Water has not been so accurately described as could be wished; fibres are mentioned which are parallel in certain directions, but I have not yet learned whether these fibres be Muscular or not. The only facts clearly proved are. That it communicates an Electrical shock. That the Upper and Under side of the Animal at a particular part, and the organ is nearly of the size of the half of ones hand

made

have this power. So that if you apply one hand to the upper, and another to the underside, you receive the shock thro' the body, the one side being electrified Plus, and the other Minus. Now does this prove that the Nervous fluid is Electrical, I would not allow a Doubt of it, and indeed would think that it proves the Contrary — For if the Brain of the Animal could generate the Electrical fluid, Why was this not conveyed directly by the Nerves to the Surface of the Animal. By means of this Engine the Electric fluid is collected in the same manner as We collect it by Art, but it does not follow that the fluid which Nerves us comes from the Brain of the Animal, nor has any One attempted to prove that. Now, How do We know but the Machine by certain powers of Nature

1209. collects this fluid, as is done by common Instruments, and that the Nerves only convey its power of motion independent of such a fluid; and supposing that the Nervous power acted by Vibration only, still there might have been room thus an Electric fluid. I do not mean to deny that our Nerves act by an Electrical Aura, or fluid, but it is still a most doubtful point, especially that the plainest experiments throw in the strongest difficulties. We do not find any thing in the Brain of an animal wh should collect the Electrical Aura in that animal which displays it in a most wonderful manner. The Brain is remarkably smaller in proportion than in Man — Next it does not appear from any experiment that an Electrical matter can be drawn from the largest nerves of animals

or

or that they are more capable of conducting it than the other parts of the body in the same state of humidity, for lets that the nerves confine it to themselves, or prevent it from spreading on all hands. But what is still stronger, We interrupt the Nervous Energy by moderate pressure, if it We sit upon the edge of a seat, We interrupt the Nervous influence to the feet by that pressure. Next, when We Remove the pressure, We are sensible of a somewhat rushing into the member with a degree of violence somewhat painful, so that we are afraid to change our situation. Now, there should a moderate pressure or ligature in fact the electrical current, let on our power by tying on a bit of Wire around another intercept it? Certainly not. Then after We have cut a Nerve

the

1211. The Muscle in which it terminates retains its power for a pretty considerable time, and there is a somewhat in the Nerve which gives power to the Muscle by a moderate pressure. I have made this experiment so often that I would not allow any Person from Theory to say that the Nerve was irritated or torn to pieces, for on a slight pressure with the finger there is immediately a motion produced, and after keeping the Nerve for a certain number of Times, the power becomes exhausted and at last totally lost. So before we can form any probable conjecture, we must have many more facts to proceed upon, and let us not advance what we cannot conceive. Now Water or the Watery fluid can enable us to feel injury, or excite Muscular action. We don't understand it, but we do not comprehend the

the Nature of the matter we let lie by, assuming an Electrical fluid, and operations more wonderful and beyond dispute produced by vessels in the Body, as the generation of [illegible] which is equally inexplicable; and yet it is probable that this is effected by fluids separated from the general mass in the two sexes; in this way the Infant is formed, and the Tenet Themselves, and what generates thro' them is that way generated. So it is better to acknowledge our ignorance of the Nature of this fluid, than rashly to reject one opinion and take up another as we can only be said to know it Nature when our ideas of it correspond with every expert yet made: without the Aid then the Tenets produce motion, and thro' them we are divided sensible of impressions. But when the Spring

I apprehend Nerves have to do something more
tho' We are not able to define it, for in the Brain
the number of the Medullary fibres vastly exceed
the fibres which go to the formation of Nerves, and
since that the proportion of these vary in different
Animals. I observe too that not only the bulk of
the Nerves, but the fibres are variously divided, many
Ex[illegible]ly, no ways towards the hole in the
Cranium, nor beginning of the Spinal Marrow.
Next, We observe that many other Animals possess
Sense and Motion in an equal or greater Degree
than Man and yet the Brain is vastly smaller.
Add to this that the powers of the Mind vary in
the different Ages, and We form the general
idea that they are somewhat interposed between
Mind and Body, the powers of the Mind are extended

tho'

tho' we will in 80 and beyond all question never will be able to understand how this happens, but we cannot help receiving it as a fact we are led to attempt an explanation of it.

Sept. 29th

At our last meeting we considered the office of the Nerves without the head, and attempted to determine, as far as facts allow of the Theory by which they operate, and I observed that the fibres within the Brain seem evidently to serve the further purpose of Medium between Mind and Body, and that according to the modification of them in the different Genera of Animals the powers of the Mind in a manner that is, and probably will remain inexplicable, seem to be varied and extended. We now proceed to trace the course of the Nerves from

 from their origin to their termination, and the powers of each part or the effects of the structure you have seen ——

I would begin with alledging that altho' from an evident difference of the Brain and Cerebellum, and of the disposition of the Cortical & Medullary substance in these two organs, with the constancy in which they are found in all the larger classes of animals, there is just reason to suspect that each performs a distinct function: yet every thing alledged by Authors on the subject is vague and conjectural, and there is no experiment which shows that the operation of these is materially different. Thus you recollect to have seen the 1st & 2d pair of Nerves of the Head, which are organs of sense, and the third, which is an organ of Motion coming from the Brain. We next saw

the

The 4th & 5th from the Cerebellum only, serving likewise for Sense and Motion; and all beneath whether of the Head or Spinal Marrow are formed from both. Next in our Examination of the Nerves by Dissection, We find only One instance, in which I alledged that the Nerve of the Right side of the head proceeded from both sides of the Brain, I mean the optick Nerves. But what We see of the one is only proved with respect to the other fact, by the plain experiment mentioned by Hippocrates, and by Many since his Time viz. That if one side of the Brain be deeply Wounded Palsy or convulsions are produced in both Sides of the body. Sometimes the Same, sometimes the opposite side is most affected. So upon the Whole We conclude that all our Nerves come from both sides of the head. We, also, the Nerves then further and [illegible]

1207. it be, and a question that the Every Nervous matter is the continuation of what is generally called the Medullary so of the Brain. The only point I doubt of is, whether the division and subdivisions whether of the Medy so of the Brain, or of any Nerve appear as Leeuwenhoek represents. I have made several experiments, but without being satisfied that from actual observation we can be assured of these extreme subdivisions. I rather apprehend that we can to have recourse to such an observation as I made with regard to the Eye.

Still however beyond all doubt the fibres appear very small, and that the Medullary part of the Brain is fibrous can admit of no doubt. It has been acknowledged by Mr Hunter that the Medulla is a Mucous matter — It appears so in the Foetal state and indeed so does every other part, but in the adult

Adult body the fibres are laid in Bundles, as is evident to the Naked Eye. I have formerly warned you in showing what are called the organs of the Nerves, that I meant only to point out those places from which the Nerve last proceeded, but for any thing we know, the Barest part of the Spinal Marrow, may come from the highest part of the Brain — We find a certain portion of Medy fibres directed to the Nerves, and we can trace ye fibres upwards thro' the whole ax of the Brain to its Cortex where we don't discover parallel fibres.

When the Nerve leaves the Brain it carries with it the Pia Mater, this all along, Coat of the Nerve goes thro' a Bone to turn afterwards among these organs it carries allong with it likewise either the Dura Mater, or a ax so like it in Colour, texture and Genl properties, that we may without

any

1219. any Material error Consider it as the same.

All good Physiologists allow that the Dura Mater is intended merely for the protection of the Nerve, that it is not to be considered as possessing any share of the Nervous Energy. Some speak of the Sensorium of Nerves as if they acted like some Chords; But even when the Nerve runs without any danger of being lacerated as in the Portio Mollis of the 7th Pair, it has no covering, but if it is exposed to the action of Muscles it carries the Dura Mater with it, & leaves it aside again at its termination.

The Dura Mater has been likewise Considered as serving merely as a Defence to the Nerve, or to conduct Blood Vessels upon it, Some say, to Nourish it. Now I cannot help suspecting that this Coat serves much more material purposes. That in the progress of the Nerve there is the same kind of Texture throughout the

throughout that we find within the head itself.
I apprehend that the Nerves begin from the
M. O. as of the Brain yet to that in Cortical as added
in their whole extent by the Pia Mater. So that the
most minute Nerve expressing the structure of the
Brain & Cerebellum. That the effects are similar
within and without the Brain — Because we
find first, in what may be called the principle
Nerve of the Body, the Spinal Marrow, a Cortical as
between the Pia Mater and the Medullary part —
Yet in Man, it cannot be shown that the Sensorium
as it is called or the Seat of that principle which
feels, and acts in consequence, extends beyond the
Head. But Mark, as soon as the Pia Mater of the
Brain is wrapped round the fibres issuing from
the Medulla of the Brain, the colour is changed
except in the case of the optic Nerve. Then below
the

1st. We divide the Blood Vessels which lie upon the Pia Mater of any Nerve in its progress I find that the powers of that Nerve are somehow or other so Weakened, that we cannot by any means, partly in the extremities being the rest of the System to sympathize. Thus, if I pour Opium under the Skin of the Leg or Thigh of a Frog in a very short time the Muscles lose the power of Contraction, and soon after the most Distant parts are in the same state. But if I tye up the Blood vessels, tho' the Animal after doing so can move the Muscles of that Limb, or feel pain when injury was offered 3 or 4 hours afterwards; yet Neverthey means of the Opium you will not be able to Disorder the Rest of the body; So that the Blood vessels dispersed to the Nerves in its in progress Contribute to Energy. In fine upon the whole I apprehend that this

this Evening is of More importance than We are aware of; and of so Diseases of the Nerves may be more Local on some occasions than is imagined. From these Cases We may look back to the origin, whereas a Disease in the Pia Mater may have a very great effect. Or it explains that. Divided the Cerebral Nerve, or, all impulse went to join it, and tho' Joined in appearance, yet the Nerve never recovers its power. And in Sir C Patterson I have seen instances of Nerves cut in my fingers Toes, and even in the Wrist but the power was never in any considerable degree restored. tho' every Attention was paid to the Posture of the Member. But in such cases We can still explain the parts by Wound &c. There is a granulation &c Actively of the Nerve which must be in a great measure derived from the Arteries running on the Pia Mater of the Nerves under the Incision, &c

1223. So that an Artery is communicated to, but we are totally deprived of the feeling.

Next, we trace the Nerves without the Head, and we observe them connected in three different ways, viz. First in the Axillary plexus we find a number of large Nerves forming arches, which are joined together and Chords sent out, and when the Sheaths of these are slit open it is evident that different Bundles were collected together, but without any such Inosculations or arches formed by the Nerves as we had seen frequently in the Arterial system. We saw another kind of connection, at least it appeared different at first sight, where two Nerves came out of holes at a considerable Distance divided into a number of minute parts then seem together and in other Arches, which more resembled those of the Arteries, but even here one cutting the Sheaths

We

We find no increase of Birth in the place where they meet nor afterwards where they separate again, which cannot be accounted for in the same manner as when several Metals are taken under one Calls of the Dice Maker. I therefore doubt the use of these connections that Chemical Metals & the particles made use of applied for a very short as possible in order to guard against accidents. But there is a third kind of connection which we cannot explain in a satisfactory manner the Georgian, i.e. Where one or more Neuter Gen^a a member of Pon Summons together and dissolve they meet forming a large Metal, much bigger than all of them merely contiguous could, for Dice Mar is this all, for the colour of the Metal is different from that of the Neuter in its parts & generally in an mere equals entire to its composition so that some of the Metals resemble the of

1225. appearance of Lymphatic glands, and if we attempt by Dissection to trace the threads of them, they suddenly and disappear, so that we are not sure by trace them thro' the ganglia. And at the other side of the ganglia many more seem to come out than entered in. We find a plexus of nervous matter including a great many blood vessels, for the threads are generally broken and the number of vessels continues for a considerable distance, and for the most part to the very end there is a diffusant appearance, but well in the trunk there is more of a brown and red colour than in the extremities.

Now, what use do these ganglia serve? As yet we can speak only from conjecture. It is probable that one function is the intermixture of nerves, as we have seen this done in other parts by the plexus, the

The Nerves are accurately mixed that every Nerve coming out is composed of all the Nerves entering into it. So every Nerve beyond a Ganglion is composed probably of all the Nerves which enter into it. Nor is it improbable from considering the fact of the Pia Mater, that the Ganglia are new sources of the Nervous Energy. But that we cannot have seen from proves. But as for all the other uses that have been assigned to them they appear to have very little if any probability. I do not mean to except even the ingenious account given lately by Dr Chevalier, which seems to me to be very ingenious. No deprivations of the powers of the Will even either in part which are necessary to life, as the motion of the Heart is not entirely to our own direction; we cannot by any effort of our Will stop it, it will not then. Jung gives a single fact quite

ou.

contains the whole spinal, and he is excusable
in Conclusion, it has not been shewn, by a Practical
Anatomist, that all the Muscles receive their
Nerves thro' Ganglia, yet he allows muscular action
to be Voluntary. So where the Posterior and Anterior
roots, join in the Nerves of the Extremities, there
are no Ganglia, as well as in those of the Bowels.
Nay there are some of the Experiments, which have
not been sufficiently attended to. So that the Heart
does not depend upon the Brain for its energy, as it
continues to move longer than the other Organs
with the Brain cut off, yet instantly upon
making the Section as above is so much Dimmed
that the Blood is not driven thro' the Extremities of
the Vessels in the distant limbs of Animals, thereby
a very different conclusion from this.
Are We with Dr. Johnson to believe that the Sym=

Sympathy, the feeling which one Nerve has with another depends upon Mechanical connection? and particularly are we to ascribe this sympathy to the connection of the Nerves in their progress? Now in considering this question, which is a very extensive one, and been treated at great length by many very late writers; we would distinguish between Sympathy in the Liberal Sense, and that kind of it which is not attended with a painful Uneasy, or with suffering to the Animal, but when when one organ is excited another is brought into play along with it, and without recollection being communicated from one part of the System to another. and I would say that a part near to one injured will more likely partake of this suffering than a more distant one. We find of

from

from Experience tho' we find a difficulty in accounting for it, and to shew the difficulty we are to attend to the connection which the Hydraulic System has with the Sentient, or that there is an action and Reaction between them. So if a middle finger be bruised the Fore and Ring finger [illegible] [illegible] more [illegible] the Hydraulic System [illegible] spreads the injury, stretches the Nerves, and extends it greatly. But we cannot wonder Nerves, that Nerves included in one sheath more readily suffer together than distant ones; and as a plain proof of that attend to what happens in the Tooth, each, suppose one of the Foretheth to be the subject of the Complaint the pain more readily spreads along the whole side of the head, than from the Foretooth of one side to that of the other tho' it be equally near. Perhaps we again

ought to say that the inflamn produced by the irritation, the affection of the Hydraulic System helps to spread and extend the seat of the pain. There are several other examples of the same thing

Next, as we are ignorant in a great measure of the Nature of Ganglia, we cannot determine how far affections may spread in consequence of their structure, only we are not altogether sure that they do spread injury more readily than the vicinity of parts, Nor can we shew in a very evident manner that the Connection of the Nerves without the Head is a Cause of extending injury in any other way than that already mentioned. But about the origin of the Nerves I think a plain fact leads us to believe that there is a mechanical Connection which has great effect; for we observe in the Palsy that one half of the body as if split in the middle, suffers from the disease

and it is not easy to account for this without conceiving that one half of the Nervous System communicates more than the opposite sides do with the Soul parts.

Next, there seems to be in the origin of the Nerves some means of conveying injury from one minute part to all the rest. Thus the Poison of Animals sticking on one Nerve in a short time destroys ye whole Nervous energy; or when after I have laid in view the Scratted Nerve of a Frog I dip the head of a Pin in Sp. C. and touch it, the limb loses its power of Sense & Motion, and tho' I immediately wash the part the Animal constantly dies. Yet you may burn the Nerve with a Red hot iron, or in any other way destroy it without producing such an effect as the Spirit does, the most minute particle of

of which they acting on the Nervous System at once deprives it of Life. So some intercourse with the Brain must be the Cause of this, tho' the manner of it We cannot in the least form any just Idea of. Now next we are to remark, and ascribe to Mechanism the motion of one part in a healthy Animal following the irritation in another? I apprehend that such Ideas should be totally Rejected, Pray there is no foundation for them however much they have been Adopted — Thus to give some Idea of my General Doctrines I will lately — If the Nose is irritated with Tobacco We Sneeze, which was accounted for in this way, That the first Branch of the 5th Pair of Nerves sends off a very small Twig called the Nasal Branch — and the second branch of the same Pair also sends off a small Nerve which makes the beginning of the Vidian Lymphatics or Intercostal Nerve,

1233. which is connected with those of the Head, Neck, and Chest, and Loins; It was therefore supposed that the Nasal twig being irritated, the irritation was communicated to the beginning of ye Intercostal and thus at length by the communication of Nerves, the Diaphragm & Abdominal Muscles are affected, & Mechanically bro^t into action; and so on with respect to the Respiration, well by ye blood in the Lungs producing an irritation, to Cough, from the Trachea being irritated &c. Now Imagine that a few very evident circumstances sufficiently Confute all such Suppositions.

First, it is well known, & may be mentioned by way of well authenticated Relation & Observe that the parts which are most connected in Nervous Sympathy, have Nerves not from the very Contiguous, but from the Same of Nature and Mind &c. & Some of those Nerves

collected together, [illegible]

Do. Manifestness most [illegible] well [illegible]

Receive a Blow or a Punchine with a Pin on the outside or

Inclining the [illegible] Pain [illegible]

Gonorrhoeay. But instead of a long [illegible]

Inconsiderable [illegible] we actually [illegible]

is away. On [illegible] [illegible] would

Some almost all the Muscles of the Heart into a [illegible]

Pain being almost equally connected. [illegible]

[illegible] which intervene between [illegible]

[illegible] and [illegible] brought into action and [illegible]

Why are not these motions [illegible]

[illegible] Will [illegible] some kind of [illegible]

[illegible] [illegible] [illegible] eye;

[illegible] [illegible]

action of the muscles on the Pelvis, and [illegible]

Gonorrhoeal [illegible] [illegible]

1235. Lord Kaimes. In short the action is regulated according to the effect we want to produce, without any relation to the nature of the sensation. And do we not observe that the passions of the Mind have the same effect, and in many instances of sympathy we are conscious of strong ideas and that the motions flow to the extremities follow ideas without the presence of any external object.

Let us attend to the manner in which each action is performed, which is very useful to study as the motions of the extremities the irritation of the retina, the manner in which Horses varies its motion in creeping, leaping, prancing &c. they are all them all fit for removing the impediments, and for avoiding the [illegible] so in walking in the dress the Lounge, Drawing the Curtains, turning a screw &c. again with a sudden violence of the mind is exhibited

Lower

[illegible] that the [illegible] [illegible] [illegible] [illegible]) the [illegible]
[illegible] produced but the [illegible] [illegible] [illegible]
[illegible] of the [illegible] and [illegible] the [illegible]
cause. If there is a difficulty in the motion of the
[illegible] [illegible], as in the state of Expiration the
[illegible] [illegible] [illegible] the [illegible] [illegible]
[illegible] the Inspiration naturally follows the
Expiration. If we are [illegible] [illegible] [illegible]
[illegible] to give the [illegible] [illegible] to [illegible] to take
way what is [illegible] the breath quicker [illegible]
[illegible]. If the Stomach is irritated, the [illegible]
is [illegible] [illegible] the Substance might have [illegible]
[illegible] when it is [illegible], [illegible] [illegible];
but if [illegible] into the Alimentary Canal, [illegible] no action but
[illegible] the action of the [illegible] [illegible]
[illegible] is [illegible]; and if it has got to the very
bottom of the Canal [illegible] [illegible] [illegible]

1237. of the Digestion [illegible] Bowels, [illegible]
Vomiting We employ these in a convulsive manner,
which in the other case We will then make an
uniform Tenure as is also done in Employing the
Tender and the Muscles in Female, during labour. So
all these actions are performed in such a manner as is
most useful, and if We proceed some further to find
the same general reason cannot be assigned that there
is no other rule to be established. In the Generation
of Animals, means are provided which are necessary
to [illegible] as of the Women, Ladies, where we cannot
trace the connection of Nerves. The [illegible] is
affected by the Heart, as from the bites of Serpents and
in mistaking of Vinegar, Heart, Salt water, Eggs, Garlic
Onions, [illegible] to Sense [illegible] the
Extremities of the Limbs. Among other Women in the
Extremities have called, that [illegible] of being of

the most strong, to remove the fund of
cause: the contraction made by the urine within
the Bladder would find the alternate action or
Motion. A Heart of this extended view has led many
to talk of Muscles being in a state of alternate Contraction
and Relaxation, but we should find their action very
much varied, and that according to the use they
are put to. It is perfectly evident that Life motions are
not produced by Mechanism, but are Guided by the
Agent, Animal Feeling, it is certainly proper to
explain, of the Nature of that Agent
Stahl, who has been followed by Cullen, and others
assigned no higher Agent than the Mind of the Animal,
that a certain irritation is made on the blood in the
Lungs and the Mind of the Animal Reasoning upon
and Understanding of Causes, Powers, and Mechanism
that they is determined to act in a certain way with the

1239. The Court. Dr Whyte afterwards, recalled the
says that there is a mind, we can't that by Mind
Energy, it has a certain energy of the body, but does so
from necessity, but is obliged to act, in laws fixed in
our nature. Does not this mean that a power superior
to our Mind directs our Motions, and to that power we have
no doubt We must at last have recourse. We cannot
separate our actions from the powers of our Mind alone,
We are ignorant of our structure, We are not so academy
in ourselves. Do We know the structure of any one
part of our body? surely not. Nor do We perceive
any bitterness, heat even any part, We are quite
ignorant of any of the Muscles, or their action when
We use them. And they are formed and so are We cannot
know the consequences and effects We have
before hand learned this by experience, so if we keep
in form and formed that it is the Power of

of the Embryo, I cannot with it, but it is done merely by My Willing to be so the Arm. So We only Examine the Action and then follows We know not how. Like other Examples and Reflect upon them. Some Animals performs the most complex actions as regularly at first if they are necessary as in the last Moment. So the first time the Plant Feed. Did as regularly as the last.

A Fakes immediately on Birth Draws in its Breath in the most Regular manner, and performs many very complex actions, viz: as Sucking and Swallowing which all Consequents of its structure is out of the question. So these are performed by a power superior to us, and which existed before us, and nothing can be more certain than that We not by knowing Saved life and Motion from a Being superior to us, But still continue to live by the uninterrupted effects of it.

124. Not forever upon us. So that when we view Men, or talk of our own we come within too narrow limits. And upon the whole, for the use of Physic we need only attend to the manner of the actions, & the Effects they give of, and the changes which we can make upon them, and so we can go no further.

Thus I have given you such an idea of that part as is useful in the practice of Physic, and when we could make our conclusions with certainty, or with a probability nearly approaching that, but all such conclusions as are vague and uncertain serve rather to retard the progress of Science &c.

Lect. 90th

To complete the Human Anatomy there remains that we commence the structure of the sev.l part.s which w.th the Bones compose the Basis of the body. For genl appearance of these, their connection and use are in a

a great measure already known to you. We shall begin with the principle part the Bone. The hardness of it, the want of Elasticity and hollowness you already are acquainted with. Two purposes are served by the hollowness, the strength of the Bone is increased and it is adapted at the same time also, for the connection of the softer organs, whilst a receptacle is given for an oily matter called Marrow. That in some instances the Bones must lose by being hollow must be allowed, as where they receive a stroke at angles which can enter the place of Breach, but in the most common accidents from the exertions of our animal body the strength of the Bone is in reality increased. That is, an attempt to break a hollow bone across May, since I can do it more easily by turning the flat side from it, than the edge. The number of fibres is the same, so their resistance is owing to their being removed further from the centre of the whole, the small parts thus in [illegible]

 breaking, for the first fibres that yield are the most distant, and the further they are removed in the centre they are the more secure.

Next let us observe their structure, and trace it from the first formation where it is best seen, particularly in a flat bone we see that the fibres come out, from a middle point, and in the long & round Bones from a line in the middle of the Bone shooting from that to the Extremities. May even in old Bones, we can by art demonstrate the fibres as evidently as in young subjects, or as distinctly as we see them in the Muscles of fish when dried.

Next we find that the fibres are not irregularly mixed together, but disposed into an appearance of Lamellæ tho' by no means so regular as those of an Onion. But we find on exposing bones suddenly to heat or to the weather, flakes separate, as layers separate from a piece of rotten Wood, and indeed there is a very great

Resemblance between the structure of a Bone and a Tree, but in a Tree it is much more regular, for its layer is tolerably smooth, whereas in the Bone it is always rough, some of the rough fibres passing outwards, and making the connection between the layers so that we are not to imagine that these are tied together by Nails, but that there is rather an intermixture to a certain degree of the constituent fibres, so that we cannot separate the Lamellæ without leaving the surface rough. Now that Lamellated structure enables us to understand the Exfoliation of Bones, that Flakes or Leaves from them separate, & this to what we see in the dead body.

Next, you observe that the hollow part of the Bone has a number of Threads & layers dividing it into small spaces; or within all the Bones, whether long, round or flat there are Cancelli, or spongy Reticulum small cavities. Purpose of [illegible]

1265. Extremities of the bone the more numerous the Cancelli become. And we find Anatomists making a division which is not altogether improper of ye Cancelli into fibres in the middle, and we may explain the first way in which the Cancelli are produced. For ye table of bone in the middle is a great deal thicker than at the end, and in proportion as the Bone grows thin, the number of the Cancelli increases, so often see at once the Cancelli are formed by the fibres of the Tables of the Bone shooting inwards & decussating each other; so the thinness of the extremity does not entirely depend upon the increase of the Diameter, for it is then beyond that, for shorten very much, or I have bled it in any way, I found the Rib bone into three pieces, the two ends & the Middle, so that the end pieces joined together are pretty exactly of the same length as the middle piece and I find that is to the same as

heavy

heavy as the Inverted prices i.e. that the tables of it have not only formed the Gables at the ends but likewise the Cancelli, so instead of observing threads of Bone we find plates, or a fibrous structure in the middle, and a Cancellated one at the extremities. Now, you know that the Cancelli contain Marrow that the cavities of the Bone are filled with it. These Cancelli serve for a support to the Marrow, to prevent one part of it from gravitating upon another; or the purpose of them with regard to the marrow is evidently the same as that of the cellular membrane under the skin to the fat. We observe then first that the Marrow is divided into a vast number of parts but when we apply the Microscope we find a much more minute division. I have formerly observed that the fat in general seem'd to cluster of Pearl when viewed thro' one of the highest magnifiers in a Microscope, and the same thing applies to the

127. The Marrow. But the lodgement of the Marrow is still more extensive than it appears on cutting a Bone lengthways, for I am certain that there are receptacles found between the plates of the Bone in their hardest parts; and that there are in reality small cells or Covers rather congested than spread last Century; and he was not mistaken in the passage of blood vessels to the Bones. For I find on cutting and breaking them, after that they burning have consumed the oil, in a Transverse section there are irregular shaped cavities passing thro' the whole thickness of the Bone, and gradually diminishing as we proceed to the surface; and that they are not blood vessels cut across, their shape is not either oval, Circular, or oval, as when we cut blood vessels in different directions, but its figure is always irregular, and resembles the shape of

of the Cancelli; and this is very evident in the bones of middle aged Persons

Now, from the ossification of their Cells diminishing as we go outward, it follows that the outermost part of a Bone is the hardest contrary to what is alledged by the Learned, on calling bones Tormentosly and giving them to Dogs the innermost part will be first, and the outermost remains in the form of a ring; so it contains more Earthy matter, and gives a greater Resistance to every injury. There may be some exceptions to this Rule, but it is a just General one. So the inner table of the Skull is more compact than the outer, but comparing the peales of either tables the Rule holds good.

[illegible] the appearance of the Cartilage, [illegible] when [illegible] of the Cartilage. That the [illegible]

1249. But in other cavities of the [illegible], the [illegible] [illegible], & partly cannot be [illegible] [illegible] cartilage which cover the extremities of Bones and the [illegible]. [illegible] of the Membranes of [illegible] [illegible], the ligaments being [illegible] [illegible] of the [illegible], I have already demonstrated them in the subject. [illegible] [illegible] that you may be able [illegible] [illegible] of the number which enter the composition of [illegible]. The Vessels of Bones conveying red blood are much more numerous than you would suppose [illegible] while [illegible]; the [illegible] of the Bones conceals the vessels, [illegible] [illegible] number of Vessels in a Muscle [illegible] by rubbing over the Muscles with a [illegible]. But that they are numerous you can convince [illegible] of Madder [illegible]. [illegible], that when [illegible] can give clear proof of the Vessels by showing them injected; [illegible] of the Bones after the

[illegible]

[illegible] to [illegible] that they are chiefly from the Ethereal Bronchium.

Waller has been led into a mistake [illegible] large to receive the [illegible] of the [illegible] and the [illegible] [illegible] are turned back again into the blood. He [illegible] that for [illegible] of the [illegible] and [illegible] enables the [illegible] occurring [illegible] above does not [illegible] [illegible] [illegible] [illegible] [illegible]

[illegible]

[illegible] Periosteum, which like a general
sheath [illegible] one to another, but what We
call Bone [illegible] either lower applies to all
[illegible] immediately beneath the [illegible]
Skin inside [illegible] Liament and [illegible]
[illegible] substance of a pure cartilage;
yet be found that the Membrane covering it and which
is in many [illegible] of the
Periosteum, as well as Cartilages and [illegible]
Bones where the [illegible] supplies [illegible]
come and [illegible] Nose, Mouth &c where this
[illegible] Bone can be made quite
[illegible] without colour till
[illegible] changed into Bone [illegible]
[illegible] Young Rabbits
[illegible] Cartilage, or Gristle, becomes Bone

1283. at a future [illegible] we [illegible] [illegible] [illegible] when entire. It is a fact worth [illegible] [illegible] that it is a circumstance which has not been attended to, and many persons who have written on this subject into the mistake of considering the cartilages, but there they are the last mark of [illegible] [illegible] since the beginning of an ossification, and the ossification in [illegible] bones goes on in a very curious manner, which [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]. There is first of all an appearance of an osseous circle, irregularly formed, which is white & opaque, [illegible] Dr. Hunter found he could distinguish bloody particles floating in the midst of blood but I am of opinion that that is carrying the matter too far. The bone begins to form in [illegible] a matter which [illegible] [illegible] it surrounds the [illegible] & takes on its shape. It is of importance to know of the manner in which bones begin to be formed of the difference between

between the extremities and those of the cartilage.

Further when you burn a bone it loses scarcely above 1/3 of its weight and 2/3 are composed of earth. Whereas if you burn cartilage there remains a very small quantity of it. Now after seeing the difference of texture we are led to conclude as authors generally do, that the bones are cartilages hardened or that the cartilage undergoes a gradual change till it is converted into bone? That opinion appears at first sight very probably and yet I apprehend it is very doubtful — It is [illegible] because cartilages are what is found in the place of parts of bone, and further they approach nearer to bone in density than the other organs do. They are covered too by a similar membrane, the membrane of some of the bones is named the membrane of cartilages. The vessels of them are very minute indeed in some of the cartilages but in the [illegible] between bone is a [illegible]

[illegible]

1235. [illegible] in
which they differ [illegible] the
[illegible] usually occupied the place of bone, but
[illegible] in very [illegible] manner. For the
most part we find that any cartilage [illegible] uniformly
into bone, the bone first a regular [illegible], the outer
part hardens, just as has been already described
and the other part adhering to the inner winding a
little as if the whole bone were accumulated for
the cartilage [illegible] and the bone [illegible].
But most [illegible] change is very perceived, but [illegible] in
a very [illegible] manner. [illegible] cartilage
[illegible] appearance of [illegible] outwards, and
[illegible] [illegible] connective, they
separate very readily, but when they are connected
are [illegible] [illegible] in [illegible]
[illegible], and there is no appearance of [illegible]
broke off. Cartilages [illegible] in which the
[illegible], just as [illegible] part of the [illegible]

[illegible] in [illegible] of the [illegible] case of [illegible].

I [illegible] not attempt to determine a matter of the [illegible] consequence to the [illegible] of the [illegible] part of the world, by [illegible] the [illegible] [illegible] and [illegible] a sound state of [illegible] which may be [illegible] [illegible] [illegible] to confine [illegible] [illegible], as [illegible] [illegible] influence without [illegible] [illegible] [illegible].

If it should be [illegible] a question, [illegible] [illegible] [illegible] to refute it, that the Bone and the Cartilage when [illegible] are insensible, or [illegible] [illegible] in consequence of it, or even allow that [illegible] of a Bone or Cartilage be destroyed, they cannot find a clear proof that all [illegible] produced from bone or cartilage are ever a cause of pain, [illegible] [illegible] [illegible] but those who do so are not aware that these are frequently produced from the Membrane and [illegible] from the [illegible] of the Bone, [illegible]

be insensible, I cannot allow sensibility to be communicated thro' it. This to me is difficult to conceive, and I cannot allow it possible.

Next, with respect to the Membrane covering the Bone I think it pretty evident that it is by no means a part of much, if any sensibility; tho perhaps there may be a greater degree of feeling than Haller seems willing to admit, who does not seem to make a sufficient allowance for the degree of chemical suffered before the Bone was brought in view. For in the case of Nodes, or large tumours on Bones, which form from various causes, there is a considerable degree of pain tho' the Integuments are not so much stretched as to be the cause of it, when there is no Node. They feel pain upon pressure, chiefly when they are warm, & when in bed &c. In this manner I apprehend the marrow is a sensible organ; Haller concludes that it wants sensibility, because it gives in

in Nature with the subsequent consequences.
But of doubt of such consequences can be always
prevented by analogy, neither can we infer that the
Narrow is an insuperable obstacle to communi-
cation Nerves, for they divide into Threads so very minute
that it may have escaped the Sense of the Sense, and
Sir Kenney a very accurate Author has entered
into the Manner of a Dog after amputation of its Leg
and Reasons that Reason, observed that the
Animal showed marks of very sharp pain and his
experiments were repeated before the Academy of
Sciences at Paris. I have made similar experiments
after a common Amputation, by stretching the end
of the Nerve with a piece of Cork and one Dog
that followed the insensibility, the Pain was less
lively, the Patient observed a good deal more
hardness, Stretch the Nerve, which probably
made the most sensible organ suffered less injury

[illegible] but [illegible] Powder [illegible]
Mixture without observing that the Patient Com-
-plained of the last pain. Upon this whole the
Jury seem and Warren seem to have a certain
degree of sensibility in a sound state but the cant
prove that when transformed so as to be in
the least dangerous to life. But with regard to the
argument, that in a sound state it ought to be felt but a
certain degree of feeling equally in every person, beyond
which it may be in one a Pain much
more intolerable & hazardous to life itself than it is in
Mr Warren & that the consideration that Patient Patient
matter whether it is felt in every Person alike which not
depends to the degree of feeling in a sound state
seem very considerable; But then he was not altogether
in the consequence of this Evidence — he
cannot regard the Points whether the
Operation produced any Mischief in them, and
the

We are not to suppose [illegible] judge of the danger of the consequences by knowing the degree of sensibility in a sound state. For of two persons equally sensible in a state of health, the one may acquire a much higher degree of sensibility by disease than the other; or upon the whole, to state the matter so far as the facts at present seem to allow us, I would observe that ligaments have some sense; and that the ligaments of the wrist, of the knee &c have nerves adhering to them; I cannot affirm that they terminate in them, but as far as dissection goes they seem to do so.

Next, I would allow to Haller that his experiments made by laying bare a ligament, pouring in an acrid liquor into the joint &c while the chemical complaint, while shew the sensibility to be but inconsiderable; and we can imagine that a tubine would have formed a membrane

for tying bones together, and subject to be stretched violently, highly sensible, and we all have experience that the parts may be stretched in certain directions and sprained without being attended with great pain, and if pain should occur in the case of Sen, the Nerves run on their surfaces to other parts, and the Brain may be owing to that, not to the ligament; for we shall admit that we can sprain those parts without feeling great pain; and in luxations the ligaments are torn, and yet we do not observe the Patient complain of very great pain. Next upon Cadaver experiments have been made of opening the joints; in some cases we are told that the Patient in time of the luxation complained of most acute pain, owing to the nerves being torn in the way, for in most cases I have known the same experiment done where

The Patient complained very little, not more than in cutting the Tendons, and not so much as in cutting the Skin — But when such operations are followed with dangerous consequences, for in them a most violent fever ensued the Patient being allowed to use the joint, and the Life and Limb saved but at great Hazard. In like manner in Rheumatism and Gout the Ligaments seem to be affected. But in the first of these, other parts as well as the Joints are frequently the seat of the Disease. So we can take up the Skin about the Joint and pull it, yet if the smallest incision is made, tho' not by the first of the Patient's own Muscles, but by taking hold of the Limb bending it immediately the Patient complains of Sharp Pain and the Disease seems to be in the Joint. So in the Whitlow swelling the Patient has a great Degree of pain, and yet the Nerve is hurt [illegible]

room for alledging that the Bellies of the Muscles are affected, and their tendons do not possess any great degree of sensibility. Even cases of the Gout the stones which form in the joints in working out, sometimes give great torture, and that before they stretch the common integuments. So upon the whole the Nerves may be affected so as to produce the most Dangerous & fatal Symptoms.

Lect 9th

Having considered the structure of the soft parts which compose the Basis of the Body, we shall next examine some circumstances relative to the texture of these parts, & partly whether the Periosteum besides serving other purposes, it serves contributes to the original formation of the Bone by detaching layers and Tartaqueous incrustations of animal matter, & in case of accidents & injuries are repaired by the Membrane, or whether the Bones grow & repair entirely by the Bone adjacent

in the common manner. I now before We
although to determine that, besides a variety of
preparations of shewing you a section of a Tree which
assembled in every particular. We found the
proper piece in drying hard by the Bark from
the Wood in consequence of the Sap was in
part detached, particularly separated into two parts
which seem again to join together at two of
these parts it is entirely compose of Wood the other
has the common appearance of a Tree viz. Bark on
the outside and Wood within, above and below
the place you see likewise the common appearance
thus, I apprehend you will make two remarks
here; the original Wood of the Tree is green
with the same proportion with Coal above & below
it, you will also see that the whole
compose of Wood as well as Bark was not
just merely the Bark of the Tree detached

1265. The uses of some parts of the Basis need no Explanation, and the Uses of Bone, Cartilage and Ligament, with the Glands of the Joints are already understood, and with respect to the Marrow I have but a single Observation to add to what I said formerly with respect to the use of the fat, that of the Marrow is the same, only perhaps We may add with Authors, that the Marrow renders the Bones flexible, tho I am not altogether sure about it, for I entirely refuse a notion that is universal, viz that the Marrow nourishes the Bone - If this was the case, on giving Meat to Young Animals, We would see the Marrow tinged, whereas it preserves its Colour, while the Bone becomes Red. It only remains therefore to determine the uses of the Periosteum, which we widently see of its purposes, that it serves to give Growth to the Bone, to allow the Muscles to slide easily upon it, serves

to

to connect more firmly the numerous pieces of which the Bones in young Animals consist; Unites the Epiphyses more closely to the body of the Bone, and extending over the ligaments of the Joints & gives to them an additional strength. And there is an internal Division of the substance which enters the Bone. But are we to these offices to add with Du Hamel that it forms the Bone by detaching layers, or are we to compare the bones of Animals to Reed, and say that the Marrow resembles the Pith, the Bone the Wood and the Periosteum the Bark? Gentlemen we see that Reed deprived of their Bark grows little, but that the Bark when detached forms fresh wood, or rather it is composed of Bundles of Wood which are [illegible] from the [illegible] of the Bark, so that on cutting a Reed angly it is not of an Uniform consistence but the internal part is the hardest [illegible]

1367. because it is the oldest. Now this argument can only create an opinion, and we can't draw from it any firm conclusion with respect to the ossifying of Animals. Let us examine Dr Hamel's further arguments, for he adds many others which he thinks do all to the same end.

First. He alledges that in very Young Animals we are able sometimes to shew, that what is bone in the middle of our extremities, as of the Thigh, is Cartilaginous at the End i.e. that the Cartilaginous has dilated & layer of Bone in the Middle, but has not yet begun to do so at the End. Now I am of opinion that things are carried here too far, Haller alledges the same thing, But they are surely in a mistake, and look for Cartilage where no such is the place of the Bone, and between these two there are at first a mutual union, so that as

as long as the end remains very soft, it is very difficult to distinguish the Periosteum from it; but when the Ossification is further advanced, without at all supposing the Periosteum to make the Ossification many of these vessels are obliterated, or ye Connection is a good deal looser.

Another argument is, Put an feeding Animal with Madder mixed with its common food, We observe a red layer on the Surface, while the inner part of the Bone is colourless. Nay that if We feed an Animal with Madder, & common food alternately, we will form alternate Circlets of Red and White. Now the outter surface does in fact receive a deep tinge, but the innermost part of the Bone receives a so little tinge, so little dom. Shewed a Proof that that Red part has been added in ye time of feeding the Animal, that it is an addition of layers, but that there is a [illegible]

126g. of the Earth tinged with the Madder made
into all the parts, and the only difficulty is to
account for the deeper tinge on the surface, and
this we readily do by attending to the manner
in which Bones grow. As they enlarge in all
their dimensions the outter parts come to be
separated at a greater distance, and the further
we go from the centre, the distance increases,
and there is more room for the deposition of an
Earthy matter, hence a greater redness, and the
outter layers are more dense than ye inner,
actually containing a greater quantity of Earth.
Dr. Hamel also does further that in old Animals
we do not communicate the tinge, but after
giving the Oldest Lady I ed procure Madder in
his food for 60 Weeks all his Bones were very
deeply tinged — And therefore I do not find room
for

for believing that the bones are formed by secretions from the Periosteum, but it is pretty evident that the new parts of the Bones like those of all the other organs are originally formed, and that they grow pretty equally in all their dimensions, and in the same manner as the rest of the body. Especially if we add another circumstance, that the Bone of a young Animal is as opaque as when grown to the red colour. Now that Bone afterwards increases and the increase is not made merely by additional thickness of Plates, but ye Medullary canal enlarges in proportion with the Bone. Now does the enlargement happen? Surely not from the Periosteum, but that the spaces between the fibres of the Bone are filled up from its own vessels. Or we find other proofs that the vessels can form a Bone at a distance from

The Periosteum, as in the case of Epiphyses, which the Ossification begins in the very middle of the Cartilage at a distance from its Membrane; I have also shown Anchylosis forming in the S. I. A. and that without any erosion.

But after endeavouring to prove that there is nothing so very singular in the growth of Bones as Dr Barnel wd all Age; I would add that the Periosteum has a greater effect in repairing the loss of Bones from accident, than Dr himself is aware of: for from his arguments and from a number of additional circumstances it appears that the supply is very much made by the Periosteum, tho' not entirely so; for the Vessels of bones can furnish a matter which is similar to the first. but we plainly find that in breaking the bones of a Animal, and tracing the growth of the fracture; that at first

the Periosteum around the Bone inflames and swells enormously beyond what I can wd imagine, especially if the Animal is Young; I have seen it 3/4 of an inch in thickness in a Pig after a fracture: in the space of a fortnight, or three weeks we find new Bony matter beginning to be deposited, and grows substance almost as firm as a knot made of bone. Now Paller & others have alledged, that indeed the Periosteum swells after a fracture, because it has a certain degree of irritability, but that the swelling ceases again without producing Bone; but I know that this is not the case, for in the thickened membrane the Bone forms, the particles of wh are not in contact wth the broken pieces but as it were in the heart of the Periosteum. the Bone gradually extending till the Callus grows to

1273. The sides of the original plates, which generally remain without much alteration or somewhat thickened, but in a great measure bare; & when the callus is completed the parts are joined together as Nature joins the broken pieces of the branch of a tree. The Bark is a tough skin and does not readily yield, and on laying up the tree there is but little growth in the woody part, but the fracture is healed by a singlet of wood from the Bark; and our bones in a great measure heal also in that manner, and the new addition is not confined to that place, but if the accident is produced by great violence, there is an addition made to the whole from end to end; We might suppose this owing to undation in the vessels of the Bone; but is the fly owing to the new addition, We find cells interposed and [illegible]

We inject the vessels of the Callus, wh are numerous & large, we can trace them from the Periosteum. I do not deny that any Vessels go in from the ends of the bone, but they are few compared with those without; may we find vessels running from the Callus into Marrow. Next when taking out a part of any Bone, as of the Cranium we do not find the hole filled up from the sides. They do swell from the irritation, but there are first a number of Vessels shooting from the Periosteum, or Dura Mater & Pericranium in the Shell, and from the extremity of these a plug is formed, like a Cork, which plugs up the hole, and begining at the middle extends to the side; and many years after the operation of the Trepan has been performed, the so has been taken out with the ligaments & Membranes showing very little connection with the Bone.

1775 A case mentioned by Mr Gooch is further a proof of this. He observes that there was something singular in it. Four or five inches of the Tibia were cut out after a fracture, thinking a proper separation thereby was extended, & kept so. Now in 3 or 4 Months he observed that the middle of the Callus was the hardest, whereas if there had been a gradual growth from the end of the bone, the end would have been the hardest. Then the ends of the Bones exfoliated, yet the callus continued to live, and the Patient recovered the free use of the Member. So that the ends of the bones had not produced that matter, or it was chiefly formed from the Periosteum. Now this fact admits of an useful application in Surgery, that in fractures we ought to pay attention to the Periosteum, to regulate the

Inflammation of it and to cause it when the Bones are laid bare?

Lect 92d

I have shown you that there is nothing singular in the original formation of the Bones, that they increase in bulk naturally in the same manner as the other organs; But if by accident or disease of Periosteum comes to be irritated & inflamed [illegible] acquires the property of forming new bone — In both cases the formation of bone depends upon a certain disposition of the parts which we cannot with certainty define; as depending upon the very same principles with [illegible] our hands. That disposition enables the [illegible] to secrete an earthy matter which from [illegible] is perhaps more readily [illegible] into bone [illegible] we find the [illegible] of a [illegible] [illegible] by the [illegible] of the [illegible]

[illegible] other the density & changes [illegible] of Metals it
appeared to speak of the pressure as the primary cause
of vibration, from [illegible] the [illegible] and
[illegible] from which [illegible] most [illegible] and
the mere pressure of the heart in delay has formed the
[illegible] that the effects which are so much expected
accident just require a morbid attraction. Their
utility, in consequence of that attraction, is different
from Mr Malleus's.

Now, most gentlemen, what I have said of the Bones forming
in the Arteries, you can readily understand when
it is found there, for this, that Nature, very often
begins in Membranes, and at last moulds
and allows them to be filled by Bone, just as
Callus forms in the Muscles and only
with time comes to adhere to the [illegible]
is partly [illegible] and partly to be [illegible]

Having from my Dissertation that, in some few cases where stone has grown to form in the Peritoneum it may be proper to take it off by an operation, but I have indeed never seen any Instance of Encystis that formed Stone itself, which as it is but the proper Generation of its Birth, and no doubt of the living matter, so it may well enough be demonstrated that we endeavour to discharge the Disease from my Body by the Barbarous use of Mercury and it may be as effectual a Question of the Dwellings upon the Stone: For in the manner understand the formation of Encysts which is in two ways as the Bladder & are grown together their Cysts & in and not by being recognized into Bone the unnatural Ligaments & the Bones. Burden produces the Cysts & Exposition is not really arises in the Ophthalmia;

1279. Such Vessels get into the Earth, is not to be
without any erosion, and deposite of earthy matter.
The other is more plain & evident & may be easily
understood. When there is an erosion of the part
of a large Point and we discover the Bones, shell, and
the beginning of Gravel, before there is an erosion of
the Ligaments, or the sound parts in the Pelvis fallen.
The anchylosis in this latter case is an attempt of
Nature to fill up the Void. And in some instances
we ought to encourage the attempt but often where
a large Point is affected, and the Bones carious
Nature fails. So if the case is not scrophulous the
Amputation is the best remedy.
Rules not from the consideration of the structure
of the Bones, form some Judgement of the affection
to which they are liable, and compare them
with those of the other parts

Jan

You have seen that there is a circulation
carried on in them even into their most minute
parts. That they have a vast number of vessels and
corresponding veins for returning the blood into the
venous system. That they have also lymphatics,
wherever there is a collection of matter within
the cavity of the Bone, we observe the lymphatics
between that part & the heart, and where the
fluid circulating & absorbent vessels enter we must
suppose that there is a chain of nerves
in them, as is sufficient to actuate them. At the
same time Anatomists do not pretend to demonstrate
the nerves of the Bones. Nor can we mention
a single instance of pain from any injury
done to them. It was wise that the Bones
or frame work should be organized in such a
manner as to suit their various purposes.

farther or require a different treatment, that
we have only to make an allowance for the
hardness of the part, & the degree of sensibility.
The sentiments have been too much followed by those
who speak of Bones & talking of structure which
are essentially different. They considered them as
Dry and Hard res and fuddled by theory more than
by Opinions applied to them Dry and Porous res
as Shells, Resins &c. I wonder that their theory
did not lead to the reverse practice, that as they
were extremely dry, rendering soft and moist in a
Neutral way. Let us see how far we can prove
the resemblance or explain the medical
affections to which the Bones are subject. & Bone
Worms Dysfrear after pain in the Joints chiefly
in heavy a much greater quantity of Carbo
water with composition. Hence the food first

first I mean to prefer to Bone from any Defect in this Earth, and which Explains Two of the frequent Diseases, I mean the Rickets and what is perhaps a more recondite Stage of that Disorder The Incarnation of Bones.

Now take the changes produced in the Rickets but so far as respects the bones, We find this to be a well defined Process, followed by Redundancies, but without any Ulceration, thus You have seen the Joints of Children grow thick, or rather the thin ends of the Bone, the softest & least dense parts swell out, in time the bodies of the bones come to be affected, and Redundancies is often, and Distortion evident, and we can in a great measure determine a priori, the way in which the Distortion will take place, tho' not exactly, for an idea of the relaxation of the texture of the bones

1889 not sufficient there is an alteration in the
vessels of the part which renders it unfit for
their Natural office, but which takes place in an
unequal manner in different bones, and also
in different parts of the same bone, & upon
the whole we may find general rules
I shew you the skeleton of a rickety child, the head is
remarkably large, yielding to the growth of the Brain
but is partly enlarged in the forehead perhaps in
some measure tho' not entirely owing to a wooden
which the head get naturally in a bad state with
from being ballanced unequally, at the fundgle of
the neck & shoulders. When a child falls asleep the
head hangs forwards, & the weight of the Brain acts
upon it as well as the ill habit of body. The cervical
vertebra instead of being very much flatt, or
even hollow, and often that bend is broke & turned
in, the whole spine, the body sinks forwards

The child is not perhaps able to carry its body
erect. But in many diseases we find it gains
late a different direction, owing perhaps to some
accidental cause as first, as stays pinching the
body, or leaning over one side of a chair, or bones
may take an unequal growth without any
assignable cause.

Next there is an alteration in the shape of the
pelvis. We find the sacrum grows sharper or rather
we find the sides of the pelvis sink inwards which
indeed is more evident in late than in the Milesian.
because of the swelling about the bottom of the ilia
with the cartilages and bones seems to be coming a
good deal both sides yielding to the weight of the
intestines as they yield when the bones of the
stomach are without the sacrum inwards.

But the weight of the viscera does not alone
damage the pelvis from perfection [illegible]

1285. The inner side — Next the Clavicle has its curvature increased by the shoulders leaning in upon it. We also find a change of shape in the Scapula, which is drawn upwards, and forwards at the Acromion, and grows round towards the middle and the change is greater than we can account for and so must be owing to more than a mere bodily pressing upon the bone.

Next the Humerus — The Humerus is very much bent. The child leans upon the Elbow, & as the bone is not absolutely straight it gives way to the weight of the body, besides the Muscles acting upon it have some effect. In the Fore Arm there is generally a curvature towards the middle and as the employing the Fingers on a table with the greatest force, they draw the Bone a little inwards. Next we observe curvature in the Ribs. The Ribs are very flexible & yield to the weight of the Body. Now & as the body

body bears down upon the top of the Thigh bone
it recedes against the Hamstrings and pushes it
inwards so that it becomes a mechanical fact
in Rickety Children although the Pelvis
and so Women who have been subject to heavy
Burdens & laborious labours. Neck of the Head
of the Thigh Bone yields downwards so that it
comes to be set nearly at a right angle with the
body of the Thigh sometimes gets so low as to be between
the two Trochanters. The Femur bent forwards
& little outwards with from his fancy on the
Thigh bones the legs are more apt to bend
towards and have been by the angle being
increased which the Neck of the Bone forms with
the Body of the Thigh bone at a quarter
inches so long that it is hard to see
Bow Knees the Shield may with out
forward the knees are brought inwards

or the Bones Inflamed and Distended
the Bones of the Skull usually incumbent some=
=what inwards & backwards and the Cavity
of the Skull and the foramina gradually increased
in size and number.

Now all these changes produced by the Hydro
Rachitis are not conceived that the Bones yield more
readily to the Forces not being sufficiently fixed
into the Pelvis or otherwise that the
Disease is in no shape contagious. We are led to
reject the Universal Idea that it is first Impan
=ted or Engendered in the Foetus. There was no
Natural Cause to occasion it then and we must
think it is different that it has existed for many
Thousand years and consider it as a general
Relaxation of the system occasioned by Poor
Food and Bad Lying and Many
other Causes that Men well skilled in
Surgery & Medicine have attributed it

of the Bell and Cavities of the Bell & Thorax
of least Cutting where the Bones were not only
crooked to a Quarter Inch from the Middle
Intestinal Tunica of Vagina by Horse
Semi-pellucid or almost Transparent like Flesh
it could be cut by the Knife & that has been
called the Incrustation of Bones.

Now, We see it following other Scurvy Disorders, or the
habit of eating a vast quantity of Sea Salt, as in
the Case of a Woman at Paris, who swallowed Two
or Three Pounds of it every week, and passed a very
uncommon quantity of Urine with a Pasty
Sediment. Now there instead of having recourse
to an acrid Solvent of Bones, let us rather attend
to the change produced in the Bones, that a
vast quantity of Earth is added in a short time
which is again very soon carried off. So either the
Earthy matter may not have been applied to

absorption continuing the same, or perhaps a greater than common proportion was taken up by the Absorbents, & the other constituent principles left; hence we can account for the harder parts becoming the softest, from their containing a less proportion of the Earth.

Next, the Bones are subject to some Disease in common with the softer parts, and particularly to Inflam.n and its consequences — Many soft organs inflamed may terminate in Death by affecting the Nerves — Now this seldom happens in Bones, as they have but few Nerves entering them But as for the other changes, or manners of termination of Inflam.n either by Suppuration Gangrene or Sphacelus, we have clear proof of their happening in Bones. We find in carious cases, and of Ulceration just as in the other organs. and every where there is an ulceration

there is a degree of Gangrene combined, and
we find appearances very like schirrus in glan=
=dulous/glandular organs as knots formed in
consequence of inflammation which are harder than
original bone; and we find too y^e bone consid=
=erably swelled & enlarged and yet almost as
compact as the original bone, and much heavier.
Next, comparing the caries of Bones with the
Erosion of the softer organs we find the same
general appearance produced, in some cases the
surface slightly affected, in others going deeper.
the part considerably swelled very often becomes
spongy; and after the erosion is as deep as the
Marrow we find a heavy matter growing out from
it, as it does from holes in the skin from the
=cutaneous cellular & fatty membrane so we
find an exact analogy in their appearance.
Nay, we can carry this deep further than

Company a number of Diseases, We can
shew that the Swelling & Erosion of the Bone
brought on by particular Diseases represent the
same kind of Swelling or Erosion brought on the soft
parts by the same Disease. So that We will be
able to determine the parts which are more ready
affected when the Bones alone suffer. And We
shall find that the Cutaneous Diseases, such as
Small Pox, Measles, Erisipelas, when they affect upon
a Bone always attack the Surface, the inflamm.
begins in the Periosteum instead of first attacking
the Medullary Cells, and separates this membrane
from the Bone. In the Rickets again We
perceive at least the effects of the disease at first
in the Cathemities of the Bone, perhaps owing
to the greater thinness there whereby it yields more
readily. Mons Gratz another instance of what
I call the Scrofula of the Bones when the Ef.

the ends chiefly suffer and the middle part rarely affected. Again, in the Venereal disease we find the hardest bone, and the hardest parts of the same bone are the most readily affected, as the erosion generally begins about the middle. So from looking at the Bone we can as well determine the kind of disease as from looking at an ulcer in the soft parts. Thus in the Venereal disease it is jagged and in the Scrophulous Caries there is the same slow progress, there is a gradual separation of parts and the same kind of colour in the Vessels of the Membranes that cover and line the Bone as when it attacks glandular organs. If again a Cancer seizes a Bone, it has much the look of a Cancerous gland and in like manner a considerable quantity of blood is sometimes lost by the [illegible]

1293. of the Non affinis seems these gen. appearances
cast will occur to Men that the Mind of Mezimont
will agree with that of the Soft part only
making allowance for the Stagnation of matter
within them in consequence of their hardness
whereby Bones have a particular Foetor, but wh
does not arise from the Marrow being more
fatid which indeed from the acid it contains is
rather less Disposed to Putrefaction than any of
the soft parts; but from the matter being long Re=
=tained. a Carious Bone requires the use of Anti=
=Septics more than an Ulcer in the soft Parts.
N.B. from the hardness of the parts we expect a
tedious separation and instead of torturing the
Patient with the Potential Cautery in order to
Detach the half Solin portion it will be better
to take out the carious piece w.th Instruments.
When he is in a sound state and entirely
to

to Vino. We would treat Cases with Dolor
after organs. The Incurvations supposed that Bite
distances were particularly hurtful to the
bones, but I have repeatedly applied them to of
Skull when laid bare without any bad effect.
But as I am unable to apply the common Dry Lime
with a Compass & Eminent to the prominent Air.
One particular kind of fracture seems to require
some further explanation as I find Dr. Hey over
Eminent Author the nature of this misunderstood
I mean the Spina Ventosa of the Arabians, who
gave this affection a name. The extremities
of the Bones are considerably swell'd and of a
white Colour, they having small holes which
gradually enlarge. The Arabian Fathers Case
fully explain, suppose the Disease to be found
in great measure by Wind, and Students a
number of Cases, prescribe rules of Diet

of the Bone they called it Spina Ventosa.
Boerhaave Vanswieten and Hunter describe
various kinds of Caries under this name and
for the cure they prescribe a variety of remedies
seeming to conceive that it may be from a
great variety of different causes as does Vonmasse
& celebrate Authors place the cure in a course
of Mercury, with a Decoction of the Woods, & Hunter
adds Surgical Excision of the Bone. Morenstead
of Paris, for a just general idea of this Disease Gives
Reference to the Writer of the last Century whose
Work is too much overlooked, making allowance
for the time in which it was wrote. I mean that
of Lawrence Wiseman, who calls it a Scrofulous
Caries of the Bone, tho he of the Surgery Physicians
of his Education forgetts the idea New appeared
the more Weakness to the Appearance in the
Arm, Peter Lawrence [illegible]

of the Justice of Kismar of Dea. It begins
nearly at the same age with scrofula, rarely
under two years of age. It affects some constitutions
and so these latter seem to have had a predisposition
to it. They heal up nearly about the same
age, neither can they be most powerful remedies
make the disease suddenly disappear, nor do
we find success from surgical operations. So
the Scrofulous disease is to be considered as a
constitutional caries and to be treated in like
manner as the other caries of the bones. The chief
of invasion I would make with regard to it is
that it cannot be cured, seeing that the disease arises
from a peculiar manner of a constitution, but it
that the swellings of glands in the Bronchocele
should be affected, so we cannot conceive
that the Lymphatic gland of general constitution
and that it originally in them, not a disease of

97. of the habit appears just in the Inguinal Glands only because there from the Afferent Vessels pass, just as the Venereal Virus does in its road to the Heart and is no more produced by those glands than the Venereal Disease is by a Bubo — It therefore depends upon a Come=what affecting the general habit, and does not at all proceed from the particular texture, as far as we yet know of any particular organ of the Body.

R. Lyon

End of the 5th Volume